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ABSTRACT

This programmed text of basic geography was created by Project Africa, a social studies curriculum research and development project established at Carnegie Mellon University (Pittsburgh, Pennsylvania). This material is intended to serve as an independent study aid for students who wish to understand basic geographic principles of location, seasons and climate, especially as they apply to Africa. Although the program is designed for high school social studies, the appended maps have been tested and incorporated into other parts of a sixteen-week, junior high school program of study on Africa south of the Sahara, (Author/BF)

GEOGRAPHY OF AFRICA

AN EXPERIMENTAL PROGRAMMED TEACHING UNIT

PROJECT AFRICA
BAKER HALL
CARNEGIE-MELLON UNIVERSITY
PITTSBURGH, PA. 15213

Prepared pursuant to a contract with the United States Department of Health, Education and Welfare, Office of Education.

1969

GEOGRAPHY OF AFRICA

A Program for High School Social Studies

This programmed study of basic geography was created by Project Africa, a social studies curriculum research and development project established at Carnegie-Mellon University (Pittsburgh, Pennsylvania) pursuant to a contract with the United States Department of Health, Education and Welfare, Office of Education.

This material was designed by Burton Witthuhn, Assistant Professor of Geography, The Ohio State University; David Meyer, Social Studies Chairman, Belvidere (Illinois) Junior High School; and Barry K. Beyer, Assistant Professor of History and Director of Project Africa, Carnegie-Mellon University. It is intended to serve as an independent study aid for students who wish to understand basic geographic principles of location, seasons and climate, especially as they apply to Africa.

This program has not been tested with students. However, the appended maps have been tested and incorporated into other parts of a sixteen-week, junior high school program of study on Africa south of the Sahara, also available from the ERIC Document Reproduction Service (see catalogue).

Fall 1969

Dr. Barry K. Beyer
Director
Project Africa

LOCATION

1. The equator crosses the countries of:

A.	Kenya and Gabon	Go to Page 2
B.	Uganda and Ghana	Go to Page 3
C.	Mali and Upper Volta	Go to Page 4

NOTE: You may refer to Maps 1 and 2 to assist you in selecting the correct answer.

Question 1

Answer A.

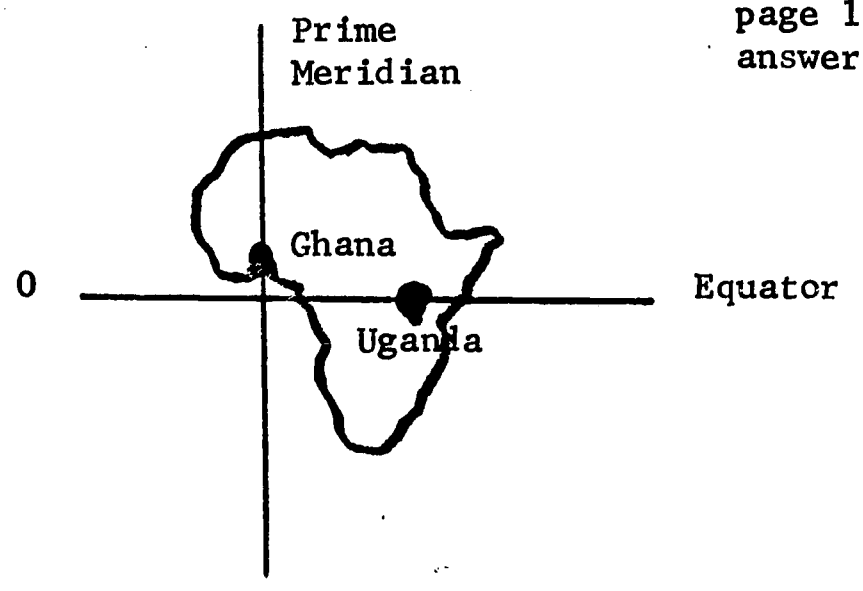
Kenya and Gabon are crossed by the equator. If the equator, an imaginary line marking 0^{o} latitude, is traced across the African continent from west to east, it would cross in order over the countries of Gabon, Congo Republic, Democratic Republic of the Congo, Uganda, Kenya and Somalia.

Go to question #2, page 5.

Question 1
Answer B.

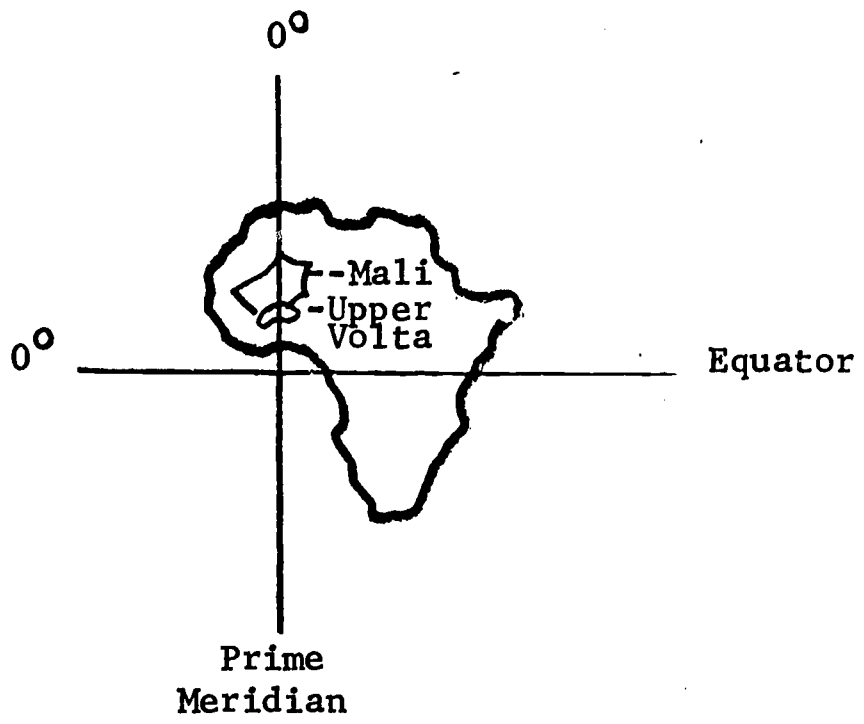
Study the diagram. Are Uganda and Ghana both on the equator?

Go Back to question 1, page 1, and pick another answer.



NOTE: The prime meridian is an imaginary line which crosses at right angles to the equator at 0° longitude. The prime meridian crosses four African countries of which Ghana is but one. Uganda, on the other hand, is crossed by the equator.

Question 1
Answer C.



Study the diagram. Are Mali and Upper Volta crossed by the equator? Go back to question 1, page 1, and choose another answer.

NOTE: The prime meridian is an imaginary line which is drawn at right angles to the equator at 0^{o} longitude. The prime meridian crosses four African countries of which Mali and Upper Volta are two.

Question 2.

Which of the following cities are 30° or more south of the equator?

A.	Algiers and Capetown	Go to Page 6
B.	Capetown and Salisbury	Go to Page 7
C.	Lagos and Port Elizabeth	Go to Page 8
D.	Capetown and Port Elizabeth	Go to Page 9

Question 2

Answer A.

Capetown is more than 30° south of the equator, but Algiers is north of the equator.

Go to page 11.

Question 2

Answer B.

Both Capetown and Salisbury are south of the equator, however Salisbury is less than 30^{o} from the equator.

Go to page 10.

Question 2

Answer C.

Both Lagos and Port Elizabeth are south of the equator, but Lagos is less than 30° south of the equator.

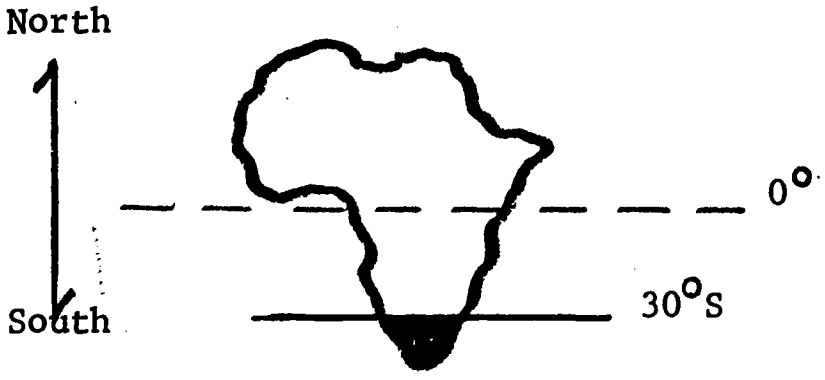
Go to page 10.

Question 2
Answer D.

Correct. Both Capetown and Port Elizabeth are more than 30° south of the equator.

Go to question 4, Page 14.

Question 3.



The shaded area lies 30° or more south of the equator. Check the cities in question to see which are located in the shaded area.

The equator is a useful starting point for locating places lying either north or south of the equator.

The country farthest north from the equator is:

A. Mazambique — Go to Page 11
B. Central Africa Republic — Go to Page 12
C. Niger — Go to Page 13

Question 3

Answer A.

Is Mozambique north of the equator?

Go back to question 3, Page 10
and try again.

Question 3

Answer B.

You have selected a country north of the equator, but does any country lie further north?

Go back to question 3, Page 10.

Question 3

Answer C.

Your answer is correct. Of the three countries, Mazambique, Central Africa Republic, and Niger, Niger is the farthest north of the equator.

Go to question 4, Page 14.

Question 4

Latitude is used to determine locations both north and south of the equator. Measurements of latitude are made in:

A. Miles — Go to Page 16
B. Degrees — Go to Page 15

Question 4

Answer B.

Your answer is correct. Latitude is measured in degrees. Latitudes can range from 0^{o} at the equator to 90^{o} at the poles.

Go to question 5, Page 17.

Question 4

Answer A.

By using the map scale on map #13 one could measure the distance between latitudes. However, latitude is determined in degrees. For example Pretoria is 26^{o} (degrees) south of the equator. Latitude values range from 0^{o} at the equator to 90^{o} at the poles.

Go to question 5, Page 17.

Question 5

Place the 0° along the margin of map 1 on Kisangi (map (cities) ___). How many degrees is Johannesburg south of Kisangani?

A. 15° Go to Page 18.
B. 26° Go to Page 19.

Question 5
Answer A.

Check to make sure you placed the 0^{o} on Kisangani (map ____).

Go to question 5, page 17 and
check your work.

Question 5
Answer B.

Answer "B" 26° is correct. Using latitude, you can determine the distance between Johannesburg and Kisangani in degrees.

Go to question 6, Page 20.

NOTE: The distance between two locations can be measured in degrees only if they have the same longitude.

Question 6

Latitude alone gives information only about distances north and south of the equator. The prime meridian is a line selected to help us to locate places either east or west of the prime meridian. Longitude, or the distance east and west of the prime meridian, is also measured in degrees.

Kano is 12° N latitude; what is its longitude?

A.	8° South	Go to Page 21
B.	8° East	Go to Page 24
C.	8° West	Go to Page 23
D.	8° North	Go to Page 22

Question 6
Answer A.

North and South measurements refer to latitude not longitude.

Go to question 7, Page 25.

Question 6
Answer D.

North and South measurements refer to latitude not longitude.

Go to question 7, Page 25.

Question 6

Answer C.

East and West measurements do refer to longitude. Kano, however is <u>east</u> of the <u>prime meridian</u>.

Go to question 7, Page 25.

Question 6
Answer B

is correct. Kano is 8^{o} East of the prime meridian.

Go to question 9, Page 31.

Question 7

Accra is located at:

A.	5° N 10° E	Go to Page 26
B.	5° N 10° W	Go to Page 27

Question 7

Answer A

If you look at a map or globe where north is placed at the top, locations in Africa to the right of the prime meridian are referred to as being east while locations to the left of the prime meridian are called west.

Go to question 8, Page 28.

Question 7

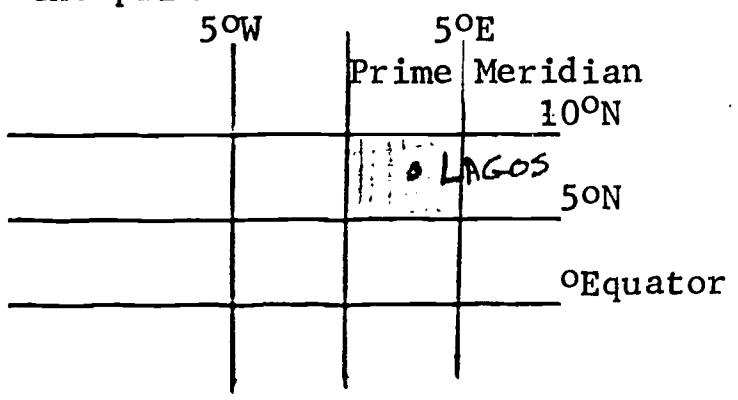
Answer B.

$5^{o}N$ $10^{o}W$ is correct.

Now go back and answer question 6,
Page 20.

Question 8

Notice on the diagram that the two reference lines used for determining all earth locations are the prime meridian and the equator. For example,



LAGOS is located at:

A. 8°N 3°E
B. 8°N 3°W

A. Go to Page 29.
B. Go to Page 30.

Question 8
Answer A.

$8^{o}N$ $3^{o}E$ is correct.

Go to question 6, Page 20.

Question 8

Answer B.

Check your work. Latitude and longitude tell us two things: direction and distance. Lagos is 8° North of the equator and 3° East of the prime meridian.

Go to question 8, Page 28.

Question 9

Which correctly locates the latitude and longitude of Addis Ababa.

A.	19°S 25°W	Go to Page 32
B.	6°S 40°E	Go to Page 33
C.	12°N 20°W	Go to Page 34
D.	9°N 39°E	Go to Page 35

Question 9

Answer A

You have not mastered the ability to use latitude and longitude. The location $19^{o}S$ and $25^{o}W$ is located in the Atlantic Ocean. Addis Ababa is not the name of an ocean going ship. Determine first whether Addis Ababa is north or south of the equator. Next, determine whether it is east or west of the prime meridian.

Go to question 8, Page 28 and carefully rework your way back to question 9.

Question 9,
Answer B.

The longitude 40°E is near Addis Ababa; however Addis Ababa is not south of the equator. A location at 6° South and 40° E would be near Mombasa.

Return to question 8, Page 28 and carefully rework your way back to question 9.

Question 9

Answer C.

The location 12°N and 20°W is close to the city of Dakar. Addis Ababa is north of the equator, but it is not west of the prime meridian.

Return to question 8, Page 28, and carefully rework your way back to question 9.

Question 9

Answer D.

$9^{o}N$ $39^{o}E$ is correct.

Go to question 10, Page 36.

SUN RELATIONSHIPS WITH LATITUDE

Question 10

The equator is most closely related to which of the following sun-earth relationships?

A. The position of the sun in the noonday sky is most directly overhead. (Go to Page 37)

B. Daylight is <u>equal</u> in length (12 hours) every day of the year. (Go to Page 38)

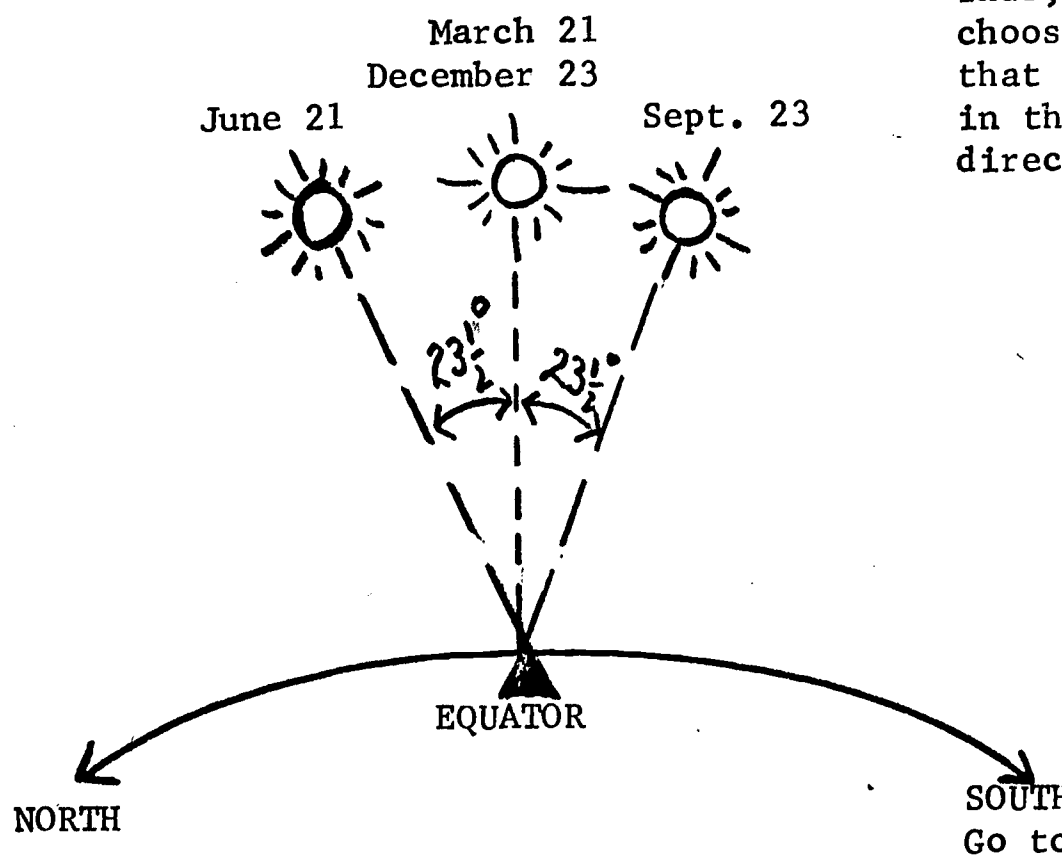
C. The highest annual average temperatures are recorded here. (Go to Page 39)

D. An arbitrary line. (Go to Page 40)

Question 10

Answer A.

The revolution of the earth around the sun in combination with the $23\frac{1}{2}^{o}$ tilt of the earth's axis causes the noon sun never to be more than $23\frac{1}{2}^{o}$ away from a directly overhead position. Thus, you are correct in choosing the answer which states that the position of the sun in the noonday sky is most directly overhead.



Go to question 11, Page 44.

Question 10

Answer B.

The length of day does vary slightly at the equator from day to day. Although the period of daylight varies less along the equator than along any other latitude, the days are not exactly equal.

Go back to question 10 on page 36
and try again.

Question 10

Answer C.

Which of the following places has the highest annual average temperature?

Which location has the lowest annual average temperature?

	City	Location	Ave. Annual Temp.
A	Equator	0°N 36°E	56°
B	Cairo	31°N 31°E	70°
C	Khartoun	16°N 33°E	85°
D	Lusaka	15°S 28°E	69°
E	Durban	29°S 31°E	71°
F	Kisangani	0°N 25°E	76°

Given a high temperature of 85°F at Khartoun (16°N) and a low temperature of 56°F. at Equator (0°), the equator can not be identified by having the highest annual average temperatures.

Go back to question 10 on page 36 and try again.

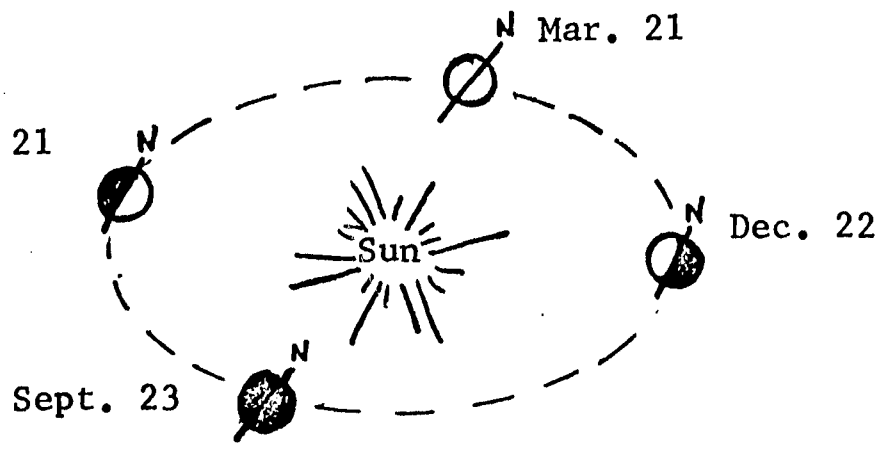
Question 10

Answer D.

The equator is frequently described as an arbitrary line since it is but one of an unlimited number of lines that can be drawn around the earth. However, this so-called arbitrary line is related to a definite earth-sun relationship.

Go back to question 10, page 36 and try again.

Question 11.



The diagram represents four positions of the earth in its annual revolution around the sun. During the year the number of hours of daylight and darkness changes for different places on the earth, from extremes of total darkness to periods of total daylight.

The length of <u>daylight</u> obtained at any location on any given day is due to:

A. The rotation of the earth — Go to Page 42
B. The revolution of the earth — Go to Page 43

Question 11

Answer A.

The term rotation refers to the spinning of the earth about its axis. The earth rotates once every twenty-four hours. Thus, each day is divided into 24 hours. Since the earth is tilted at $23\frac{1}{2}^{o}$, some locations may receive more than 12 hours of sunlight or no sunlight at all as the earth revolves around the sun. Although the earth always has half of its surface exposed to sunlight, the differing periods of sunlight are caused by the revolution of the earth about the sun in connection with the tilt of the earth's axis.

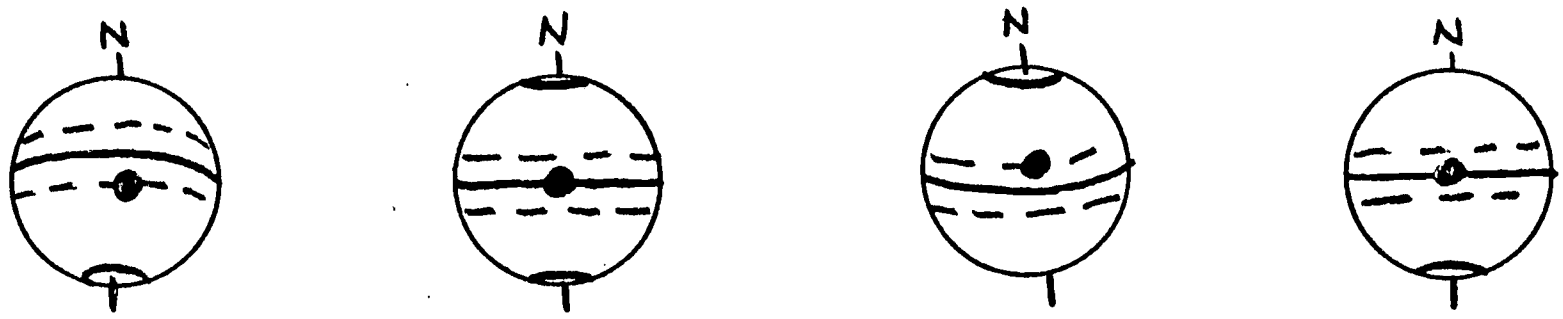
Go back to question 11, Page 41.

Question 11
Answer B

The term revolution is correct. As the earth revolves around the sun, the unchanging tilt of the earth axis causes differing amounts of daylight to occur at differing latitudes.

Go to question 12, Page 44.

Question 12



Dec. 23 (Tropic of Capricorn) | Mar. 21 (Equator) | June 21 (Tropic of Cancer) | Sept. 23 (Equator)

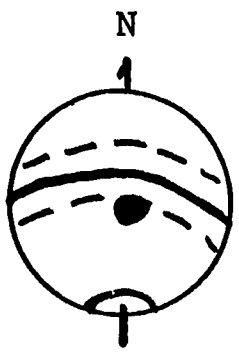
The diagram above shows the same four positions of the earth with relationship to the sun as shown in question 11. Place your pencil on the center point shown on each drawing to determine where the direct rays of the sun fall. Your pencil should be held upright . Notice that in each drawing you are observing the portion of the earth lighted by the sun on December 23, March 21, June 21, and September 23 respectively. If the half of the earth north of the equator is referred to as the northern hemisphere and the other half of the earth as the southern hemisphere, which hemisphere receives the greatest amount of sunlight on December 23?

A. Northern Go to Page 45

B. Southern Go to Page 49

C. Neither Go to Page 50

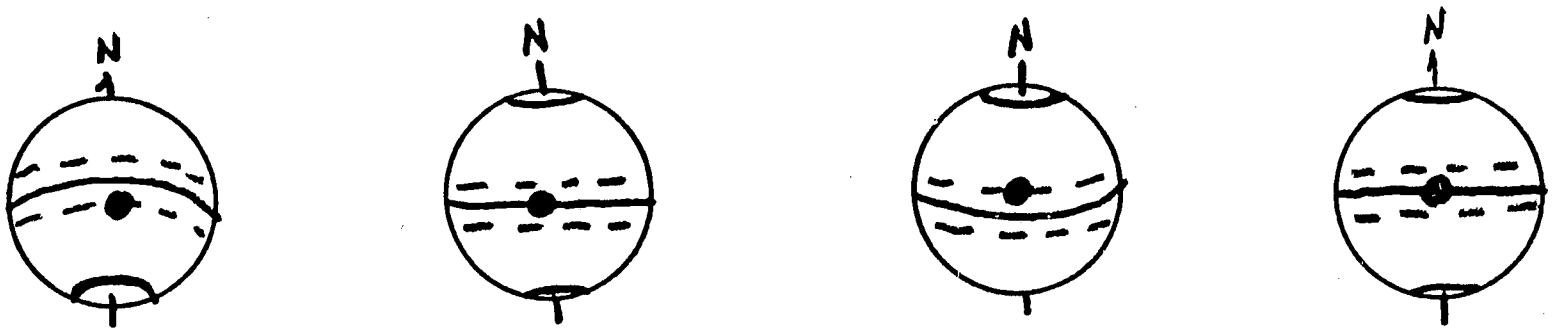
Question 12
Answer A.



Can you see the north pole on the drawing? If not, you are looking at the southern hemisphere. Look at the drawing for June 21 (page 44), notice, can you now see the north pole. Therefore, June 21 is the time when the northern hemisphere receives the greatest amount of sunlight.

Go to question 13, Page 45.

Question 13



Dec. 23 (Tropic of Capricorn) | Mar. 21 (Equator) | June 21 (Tropic of Cancer) | Sept. 23 (Equator)

By placing your pencil on the center point shown on the diagram for December 23 we can see that a greater portion of the southern hemisphere receives light from the sun than the northern hemisphere.

Place your pencil on the center point in the diagram for June 21. Which Hemisphere receives the greater amount of sunlight on June 21?

A. Northern — Go to page 47
B. Southern — Go to page 48

Question 13
Answer A

The northern hemisphere is correct.

Go to question 14, Page 51.

Question 13
Answer B

The line named the tropic of cancer represents the most northerly location on the earth's surface that receives the direct rays of the sun. While the sun is at this position the south pole does not receive any light from the sun.

Return to question 13, Page 46, and try again.

Question 12
Answer B.

The southern hemisphere is correct.

Go to question 14, Page 51.

Question 12
Answer C.

The diagram of the sun's position on December 23 shows the south pole, but the north pole is not shown because the north is tilted away from the sun on this day of the year. Thus, the northern and southern hemispheres are not similar.

Go to question 13, Page 46.

Question 14

Referring to the diagrams in questions 11 and 12 place x's in the following chart to show when the sun's rays are directly overhead.

		Dec.	Mar.	June	Sept.	Dec.
North Pole	(90°N)					
Tropic of Cancer	(23½°N)					
Equator	(0°)					
Tropic of Capricorn	(23½°S)					
South Pole	(90°S)					

Go to Page 52.

Question 14
Answer

		Dec.	Mar.	June	Sept.	Dec.
North Pole	(90° N)					
Tropic of Cancer	(23½° N)			X		
Equator	(0°)		X		X	
Tropic of Capricorn	(23½° S)	X				X
South Pole	(90° S)					

If your answer agrees with the chart, go to question 15, Page 53.

If your answer does not agree, check the following facts.

A. The noon-sun is directly overhead at a different latitude each day of the year.

B. Since the earth revolves around the sun once each year, the overhead sun, as observed from the earth, migrates across the sky following a set cycle, which repeats itself every twelve months.

C. Every six months (March, September) the noon-sun is directly overhead at the equator.

Go to question 15, Page 53.

LATITUDE - CLIMATE AND RELIEF

Climate is often described in terms of temperature and rainfall. Two factors directly related to the temperature and rainfall pattern of any area are:

1. the directness of the sun's rays
2. the number of hours of daylight.

The next several questions will look at these relationships as they apply to Africa.

Question 15.

Information on average monthly temperatures is available for many places in Africa. Kisangani, the Congo, located at 0°N, 25°E has average monthly temperatures of:

Months	J	F	M	A	M	J	J	A	S	O	N	D	Average Annual
	79	79	79	78	78	76	76	77	77	77	77	77	78

The highest average monthly temperature is 79 (Jan, Feb, March).
The lowest monthly temperature is 76 (June, July).
The range (difference between highest and lowest) is 3°F

The 3° range in Kisangani average monthly temperatures is probably a result of:

A. Latitude Go to Page 54
B. Longitude Go to Page 55
C. Climate Go to Page 56

Question 15

Answer A

Latitude is correct. Locations near the equator show little difference between the highest and lowest temperatures because the sun is never far from being directly overhead.

Go to question 16, Page 57.

Question 15
Answer B

Longitude is not directly determined by a sun-earth relationship, and thus has no effect on temperatures.

Go back to question 15, Page 53.

Question 15
Answer C

Climate is a description of a combination of factors. Temperature, rainfall, winds, and humidity are all part of climate.
Climate does not affect temperatures, but is partly a description of temperature conditions.

Go back to question 15, Page 53.

Question 16

The table below contains the average monthly temperatures for three African locations as well as the computed temperature ranges.

Month	J	F	M	A	M	J	J	A	S	O	N	D	Range
Kampala	74	74	73	72	71	70	70	70	71	72	72	72	4°
Equator (Kenya)	57	58	58	58	57	55	54	54	55	56	56	56	4°
Eala	78	79	79	79	77	75	75	77	77	77	77	77	4°

Kampala, Equator, and Eala:

A. are close to the equator since they have equal ranges in their temperatures.

Go to Page 58.

B. are at different latitudes due to the colder temperatures at Equator (Kenya).

Go to Page 59.

C. are close to the equator since they have very small temperature ranges.

Go to Page 60.

Question 16

Answer A.

Places at the same latitude often will have nearly the same range in their average monthly temperature. Both Lusaka and Zambia have an average temperature range of 14^{o} but are not located on the equator.

Go back to question 15, Page 53.

Question 16
Answer B

Not all stations at the equator have extremely high temperatures. Temperature differences may be caused among other things by elevation (height above sea level) as well as by latitude.

Go back to question 15, page 52.
Look for an important clue to help you answer this question.

Question 16
Answer C.

Good. Equatorial locations are characterized by small temperature ranges.

Go to question 14, page 61.

Question 17.

Use the range of average monthly temperatures to indicate which of the following places is located nearest to the equator.

A. Johannesburg — Go to page 62.
B. Lusaka — Go to page 63.
C. Mubende — Go to page 64.

	J	F	M	A	M	J	J	A	S	O	N	D	Range
Johannesburg	68	68	65	61	55	51	51	56	61	65	66	68	_____
Lusaka	71	71	68	69	66	62	61	65	67	76	74	72	_____
Mubende	71	71	70	69	68	68	68	68	68	68	69	69	_____

Question 17
Answer A.

Johannesburg has a range of 17°, which indicates it is not near to the equator. In question 16 you should have observed ranges as small as 4° existing near the equator.

Go to Question 18, page 65.

Question 17
Answer B.

Lusaka has a range of 15^{o}, which indicates it is not near to the equator. In question 16 you should have observed ranges as small as 4^{o} existing near the equator.

Go to question 18, page 65.

Question 17
Answer C.

Mubende at $1^{o}N$, $31^{o}E$ is nearest to the equator with a range of 3^{o}.

Go to question 19, page 69.

Question 18.

Latitude	Place	Range
30°N	Cairo	27°
10°N	Kano	17°
0°	Kempah, Equator, Eala, Kisangani, & Mubende	3°-4°
15°S	Lusaka	15°
26°S	Johannesburg	17°

The chart shows the relationship of temperature range with latitude.

What appears to happen to the temperature range as the latitude is changed?

A. As one moves away from the equator, the range in temperatures increases.
Go to page 66.

B. As one moves away from the equator, the range in temperatures decreases.
Go to page 67.

C. There is no effect on the range of temperatures as one changes latitude.
Go to page 68.

Question 18
Answer A.

Good! Go back and try question 17 again, page 61, remembering that AS ONE MOVES AWAY FROM THE EQUATOR THE RANGE IN TEMPERATURE INCREASES.

Question 18
Answer B.

The temperature ranges at Kano and Lusaka is greater than that of Kampala, Equator, Eala, Kisangani and Mabende. Thus, the range in temperatures could not be decreasing.

Go back to question 18, page 65, and try it again.

Question 18
Answer C

One can observe that the range of temperatures does vary with latitude, increasing as one moves away from the equator.

Go back to page 65 and try Question 18 again.

Question 19

The Tropic of Cancer and the Tropic of Capricorn (See Map #2) are the most northerly and southerly limits on the earth's surface that receive the direct rays of the sun.

The chart portrays the average monthly temperatures for three places in Africa. The location closest to the Tropic of Capricorn is place (A), (B), or (C). _____

Place	J	F	M	A	M	J	J	A	S	O	N	D	
A	80	80	76	71	63	58	56	61	65	71	75	79	Go to page 1.
B	75	77	83	89	92	93	89	87	90	90	83	77	Go to page 2.
C	66	67	67	67	64	62	60	61	64	66	65	65	Go to page 3.

Place A. Go to page 70.
Place B. Go to page 71.
Place C. Go to page 80.

Question 19
Answer A

Keetmanshoup, Southwest Africa (27°S, 18°E) is closest to the Tropic of Capricorn. You have correctly observed the relationship between the sun position and the average monthly temperatures.

Go to question 22, page 81.

Question 19
Answer B

Khartoum, Sudan (16°N,33°E) is quite far from the Tropic of Capricorn (23 1/2°S). The fact that the highest average monthly temperatures occur in May and June places Khartoum in the northern hemisphere.

Go to question 20, page 72.

Question 20

Check the answer which was given to question 14, which is repeated below:

		Dec.	Mar.	June	Sept.	Dec.
North Pole	(90° N)					
Tropic of Cancer	(23½° N)			X		
Equator	(0°)		X		X	
Tropic of Capricorn	(23½° S)	X				X
South Pole	(90° S)					

The Sun's Rays Directly Overhead

The sun's direct rays are over the Tropic of Cancer in

A. June — Go to Page 73
B. December — Go to page 74

Question 20
Answer A

Good. The sun's rays are most directly overhead in June.

Go to question 21, page 75.

Question 20
Answer B

No, the sun's rays are most directly overhead in June.
Go back to page 72 and study the diagram before trying question 20 again.

Question 21

In which month does the highest temperature occur in Khartoum?

	J	F	M	A	M	J	J	A	S	O	N	D
Khartoum	75	77	83	89	92	93	89	87	90	90	83	77

A.	March	Go to page 76.
B.	June	Go to page 77.
C.	September	Go to page 78.
D.	December	Go to page 79.

Question 21
Answer A

93° is the highest average monthly temperature at Khartoum. This does not occur in March. Therefore, return to question 21, page 75, and select another answer.

Question 21
Answer B

Good. June does have the highest temperature. You have now matched the month of highest temperature and the period when the sun's rays are most directly overhead. Return to question 19 and do the same thing. Match the month when the sun is directly over the Tropic of Capricorn with the location that has its highest temperatures during the same time of year.

Go to page 69.

Question 21
Answer C

September - 93° is the highest average temperature for Khartoum. The highest temperatures should come near the time of the year when the sun is directly overhead.

Go back to question 21, page 75.

Question 21
Answer D.

No, the highest monthly temperature is 93°. This should come during the time of the year when the sun's rays are most direct.

Go back to question 21, page 75, and try again.

Question 19
Answer C

Nairobi, Kenya (1°S, 37°E) is located nearest to the equator. Nairobi can be observed to have the smallest range of average monthly temperatures of the three given locations. However, to identify the Tropic of Capricorn, it is necessary to consider when the direct rays of the sun are overhead. Since temperatures are controlled by the direct rays of the sun, average monthly temperatures provide a clue for identifying the Tropic of Capricorn.

Go to question 22, page 81.

Question 22.

	Dec.	March	June	Sept.	Dec.
North Pole					
T.of Cancer			X		
Equator		X		X	
T.of Capricorn	X				X
South Pole					

The Sun's Rays Directly Overhead.

The sun's direct rays are on the Tropic of Capricorn in

A. March — Go to Page 82.
B. June — Go to Page 83.
C. September — Go to Page 84.
D. December — Go to Page 85.

Question 22
Answer A

No. The "X" indicates the sun is over the equator in March and September.

Try question 21 again, page 81.

Question 22
Answer B

The "X" indicates the sun is over the Tropic of Cancer in June.
Go back to question 21, page 80,
and select another answer.

Question 22
Answer C

The "X" indicates the sun is over the equator in September and March.

Go back to question 20, page 80.

Question 22
Answer D

Yes, the sun is over the Tropic of Capricorn in December.
Go to question 23, page 86.

Note: The highest monthly temperature for Johannesburg, located 26°S of the equator, occurs in December.

	J	F	M	A	M	J	J	A	S	O	N	D
Johannesburg	68	68	65	61	55	51	51	56	61	65	66	69

Thus, the highest average monthly temperature is observed to be closely related to the high sun position. That is, the highest monthly temperature occurs during the period when the sun is directly over the Tropic of Capricorn. Similar temperature-sun position relationships exist for all locations between the latitudes of 23½° North and South.

Question 23.

Examine the temperature chart below.

	Latitude	Longitude	Elevation	J	F	M	A	M	J	J	A	S	O	N	D
Kisangani	0°N	25°E	1370'	79	79	79	79	78	78	76	76	77	77	77	77
Equator	0°	35°E	9062'	57	58	58	58	57	55	54	54	55	56	56	56
Mobassa	4°S	40°E	52'	81	82	83	81	79	78	76	76	77	79	80	81

The differences in average monthly temperatures are most probably caused by

A. Latitude — Go to page 87.
B. Longitude — Go to page 88.
C. Elevation — Go to page 89.
D. Sun position — Go to page 90.

Question 23
Answer A

Since Kisangani and Equator are both at the same latitude and Mombassa is also near to 0^{o}, latitude is not the reason for temperature variations.

Try again. Go to question 23, page 86.

Question 23
Answer B

Sun position is a major control influencing temperatures, and as sun position is clearly associated with latitude, longitude must be rejected.

Try again. Go to question 23, page 86.

Question 23
Answer C

Clearly, the higher the elevation the lower the temperature becomes all other factors being equal. Notice that Mombassa at an elevation of 52 feet has the highest average temperatures.

Go to question 24, page 91.

Question 23
Answer D

Sun position is a major control influencing temperature. Since sun position is clearly associated with latitude, sun position must be rejected.

Try again. Go to question 23, page 86.

Question 24.

Temperature and rainfall data are useful for differentiating between different climatic regions. For example, the chart below shows the average monthly temperature and the inches of monthly rainfall for three places in Africa.

Location		Months											
		J	F	M	A	M	J	J	A	S	O	N	D
A. Khartoum (16°N,33°E)	RF	0	0	0	0	0	0	2	3	1	0	0	0
	T	75	77	83	89	92	93	89	87	90	90	83	77
B. Addis Ababa (9°N,39°E)	RF	0	2	3	3	3	5	11	12	8	1	1	0
	T	59	62	63	64	64	62	60	60	61	60	58	57
C. Lusaka (15°S,28°E)	RF	9	7	6	1	0	0	0	0	0	0	4	6
	T	71	71	70	69	66	62	61	65	67	76	74	72

Note: RF = inches of rainfall
T = average monthly temperature

Which of the following statements best describes the relationship existing between the rainfall pattern and the temperatures shown above?

A. The period of heavy rainfall comes just before the month when the sun's rays are most directly overhead.
Go to page 92.

B. The period of maximum rainfall (greatest amount) follows the month when the sun's rays are most directly overhead.
Go to page 93.

Question 24
Answer A.

Look at the temperature and rainfall for Khartoum.

A. Khartoum (16^{o}N, 33^{o}E)

	J	F	M	A	M	J	J	A	S	O	N	D
RF	0	0	0	0	0	0	2	3	1	0	0	0
T	75	77	83	89	92	93	89	87	90	90	83	77

The highest temperature (93^{o}) occurs in June.

During the month of June the rays of the sun are most directly overhead at Khartoum.

Note the period of rains (the rainy season) begins in July.

Go to question 25, page 95.

Question 24
Answer B

Good! You have matched the months having the highest temperatures with the period when the rays of the sun are most directly overhead. The increase in rainfall is associated with the shifts in weather systems that follow the shift in the position of the sun.

Go to question 26, page 98.

Question 25.

The rainy season for Addis Ababa (page 91) begins before the rainy season for Khartoum because:

A. Addis Ababa is cooler and has a smaller range of temperatures.
Go to page 95.

B. Addis Ababa is in the opposite hemisphere.
Go to page 96.

C. Addis Ababa is closer to the equator than Khartoum.
Go to page 97.

Question 25
Answer A

With every 1000 feet increase in elevation the temperature of the air drops about 3.5 degrees Fahrenheit. Thus, Addis Ababa at an elevation of 8000 feet will have cooler temperatures than Khartoum which is at 1200 feet above sea level if no other factors are considered. However, the latitude and smaller range in monthly temperatures show Addis Ababa to be closer to the equator than Khartoum. Since the shift in rainy seasons follows the cycle of high sun position, Addis Ababa being closer to the equator than Khartoum, will have an earlier rainy season.

Note the months of highest sun position for the Tropic of Cancer, the equator, and the Tropic of Capricorn.

	Dec.	March	June	Sept.	Dec.
Tropic of Cancer ($23\frac{1}{2}^{o}$N)			X		
Equator (0^{o})		X		X	
Tropic of Capricorn ($23\frac{1}{2}^{o}$S)	X				X

If the higher temperatures generally occur at the time of the highest sun, and if the rainy season follows the month of highest temperatures, a city located nearer to the equator will have an earlier rainy season than one nearer to the tropics.

Go back to question 25, page 94.

Question 25
Answer B

Look again at the locations of Addis Ababa and Khartoum. They are both on the same side of the equator. Therefore, they are in the same hemisphere.

Go back to page 94 and try question 25 again.

Question 25
Answer C

Correct. Addis Ababa has its highest temperatures during May when the sun's rays are directly overhead for the first time. Note, the sun's direct rays will be over Addis Ababa again in July as the earth continues its revolution around the sun. However, due to the cooling effects of the rainy season, the monthly temperatures do not clearly show this second period of direct overhead sun. The start of the heavy rains comes in June following the period of direct overhead sun. Khartoum, farther to the north has its highest temperatures about one month later - June. Consequently the season of heaviest rains follow in the month of July.

Now question 24 should be easy.
Go to page 91 and try it again.

Question 26.

Points to remember:

1. During the course of a year, the position of the sun relative to the earth does change. In March and September the rays of the sun are most directly overhead at the equator. In December and June the noon sun is most directly over the Tropics of Capricorn and Cancer respectively.

2. As the rays of the noon sun become more directly overhead, the average monthly temperature rises.

3. Following the month of highest average temperatures in tropical Africa, the period of heaviest rain occurs.

Therefore, cities located on the equator:

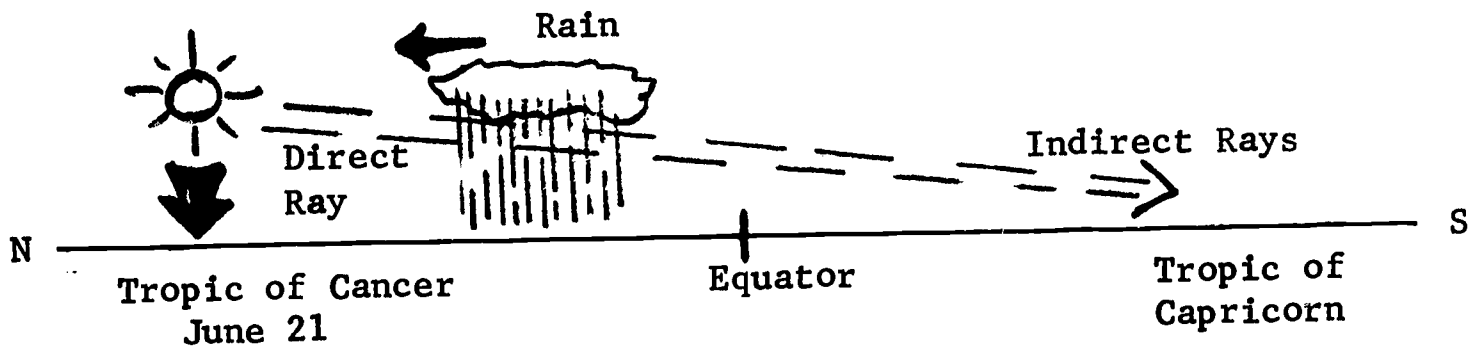
A. should have a pattern of rainfall opposite that of cities in the Southern Hemisphere.
Go to page 99.

B. should have two wet and two dry seasons.
Go to page 100.

C. should have some rainfall throughout all months of the year.
Go to page 108.

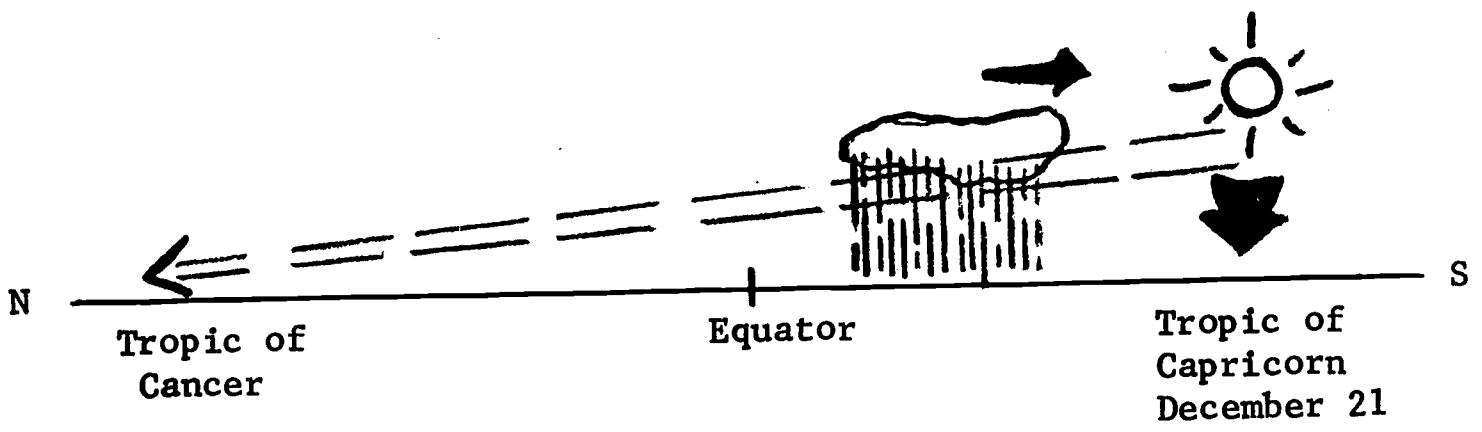
Question 26
Answer A.

While the rainfall pattern for locations to the north and south of the equator tend to display patterns that are the opposite of one another, locations near to the equator do not show such contrasts.



High Temperatures to be followed by wet season.

Low Temperature Dry Season



Low Temperature Dry Season

High Temperature to be followed by wet season.

Question 26
Answer B

Your choice of this answer shows that you understand the relationship of the position of the sun and the following rains.

Go to question 27, page 101.

Question 27.

If you wanted to show the period of heaviest rains atthe equator, you would need maps for

A.	April and October	Go to page 102.
B.	March and September	Go to page 103.
C.	December	Go to page 104.

Question 27
Answer A

April and October do follow the months of direct overhead sun, and would be the correct answers.

Go to question 28, page 105.

Question 27
Answer B

March and September are the months of direct overhead sun and precede the months of heaviest rainfall. The season of rains follows the month of direct overhead sun.

Go back to question 27, page 101 and try again.

Question 27
Answer C

In December, the sun's direct rays are over the Tropic of Capricorn. If the period of heaviest rain follows the time of the direct overhead sun, the equator must have two periods of heavier rainfall.

Go back to question 27, page 101 and try again.

Question 28.

Study the charts below to determine how the monthly rainfall patterns vary for the three locations. Then try question 28.

Location		J	F	M	A	M	J	J	A	S	O	N	D
Kisangani 0°N,25°E	RF	2	3	7	6	5	5	5	7	7	9	8	3
	T	79	79	79	79	78	78	76	76	77	77	77	77
Lusaka 15°S,28°E	RF	9	7	6	1	0	0	0	0	0	0	4	6
	T	71	71	70	69	66	62	61	65	67	76	74	72
Kano 12°N,8°E	RF	0	0	0	0	3	5	8	12	6	0	0	0
	T	71	75	83	88	87	84	80	78	79	81	77	72

Months with Rain

		J	F	M	A	M	J	J	A	S	O	N	D
Kisangani	0°	X	X	X	X	X	X	X	X	X	X	X	X
Lusaka	15°S	X	X	X	X							X	X
Kano	12°N					X	X	X	X	X			

The monthly rainfall pattern for Kisangani, located on the equator, differs from the rainfall patterns of Lusaka and Kano in that:

A. it has the rainfall distributed throughout the year.
Go to page 106.

B. it has a shorter dry period.
Go to page 107.

Question 28
Answer A

Yes, as the sun moves from the Tropic of Cancer to the Tropic of Capricorn and back again, the equator is constantly in the path of weather systems producing some rainfall. As a result of this, we find that areas near to the equator have rainfall throughout the year. However, areas near the equator may also show two periods of heavier than average rainfall. For Kisangani these "peaks" of rainfall occur in October and March.

Go to question 30, page 109.

Question 28
Answer B

The three months with the least amount of rainfall are December, January and February. Although these months are drier than the rest of the year, at Kisangani, they do receive a total of eight inches which far surpasses the dry periods at Lusaka and Kano.

Go to page 106 being careful to check the answer given against the charts on page 105.

Question 26
Answer C

"C" is correct. Notice places on the equator such as Kisangani do not have a dry season in that some rainfall occurs in each month

	J	F	M	A	M	J	J	A	S	O	N	D
Kisangani	2	3	7	6	5	5	5	7	7	9	8	3

as the sun moves from the Tropic of Cancer to the Tropic of Capricorn and back again. The equator is constantly in the path of weather systems producing rainfall. However, areas near the equator often show two periods of heavier than average rainfall falling the months of the highest noon sun.

Go to question 30, page 109.

CLIMOGRAPH AND REVIEW

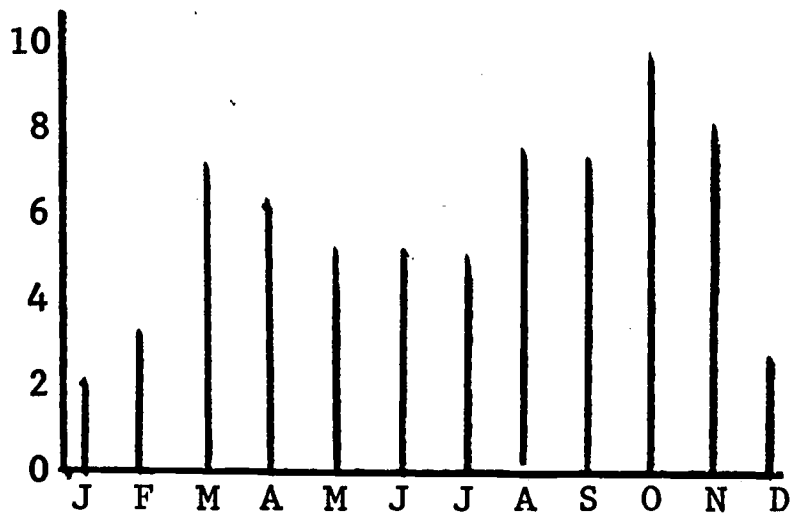
Question 30

The monthly temperature and rainfall data can be given in both numerical and graphic form. For example the monthly rainfall data for Kisangani in numerical listing is:

	J	F	M	A	M	J	J	A	S	O	N	D
Rainfall (inches)	2	3	7	6	5	5	5	7	7	9	8	3

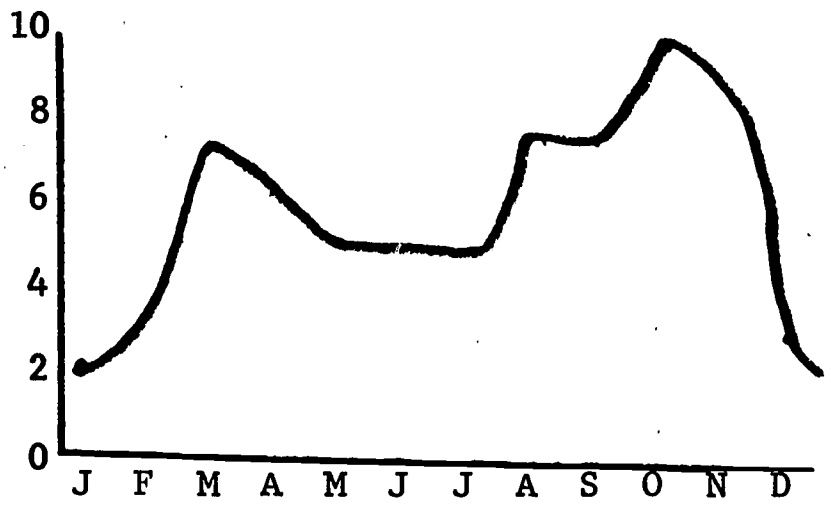
Graphically, this same information is best shown in diagram:

A)



Go to Page 110

B)



Go to Page 111

Question 30
Answer A

The bar graph is the correct choice for showing the average monthly totals of rainfall. Note that there is a different bar for each month. To read the number of inches use the column of numbers along the left-hand edge of the graph.

Go to question 31, page 112.

Question 30
Answer B

Although the points shown for each month on this line graph are equal to the number of inches of rainfall in the numberical listing (page 109), the lines connecting the points make the graph incorrect. A bar graph, as shown in Answer A is a better choice.

Go to page 110.

Question 31.

Why are the months of March and October significant in the rainfall graph for Kisangani (Page 109)?

A. The months of March and October receive more rainfall than any of the other months.
Go to page 113.

B. The months of March and October are "peaks" of rainfall. March receives the most rainfall of any month in the first half of the year while October receives more rainfall than any month in the latter half of the year.
Go to page 114.

Question 31
Answer A

October receives the greatest amount of rainfall of any month of the year. However, October and November receive more rain than March does. Therefore, you should have selected choice "B" which states that the months of March and October are "peaks" of rainfall. March receives the most rainfall of any month in the first half of the year while October receives more rainfall than any month in the latter half of the year.

Go to question 32, page 115.

Question 31
Answer B

Yes, March and October have rainfall peaks. These peaks of rainfall closely follow the months in the year when the sun is directly over the equator.

Go to question 32, page 115.

Question 32.

Which of the following places is most likely to be located on the equator?

A. A place with 12 hours of daylight and 12 hours of darkness on June 22 and December 22.
Go to page 116.

B. A place with 10 hours of daylight and 14 hours of darkness on December 22, and 14 hours of daylight and 10 hours of darkness on June 22.
Go to page 117.

Question 32
Answer A

Your selection of the "A" answer is correct. The length of daylight at the equator is equal to nearly twelve hours every day of the year but particularly on the equinoxes (days when both poles receive sunlight and the noon sun is directly over the equator) of June and December.

Go to question 33, page 118.

Question 32
Answer B

You should have discovered in question 11, page 41, that the length of daylight and darkness are nearly equal to 12 hours every day of the year. As one moves away from the equator, the hours of daylight increase or decrease with respect to the apparent shift of the axis of the earth as the earth revolves around the sun.

Review questions 10 through 12, pages 36 to 45 before trying question 33, page 118.

Question 33.

In question 30 (page 109) rainfall data was depicted both in a numerical listing and graphically. Average monthly temperatures can be depicted in two ways as well. For example, the numerical listing of average monthly temperatures for Kisangani is:

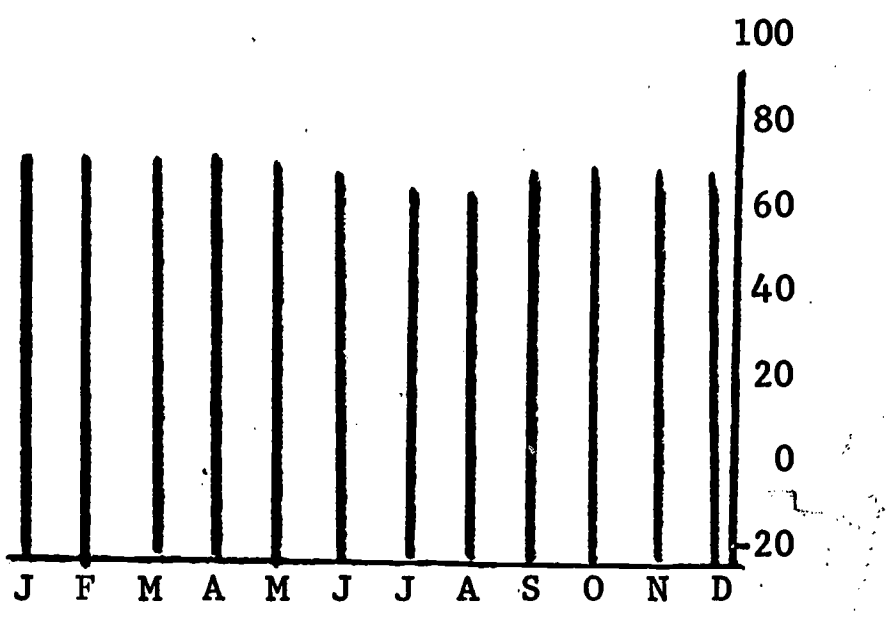
	J	F	M	A	M	J	J	A	S	O	N	D
Temperature	79	79	79	79	78	78	76	76	77	77	77	77

Graphically, this same information is best shown in diagram:

A)

Go to Page 119

B)



Go to Page 120

Question 33

Answer A

The use of a line graph for showing average month to month temperatures is the correct choice. The line graph permits us to view the trend in temperature changes. Since a bar graph was used earlier for rainfall data, use of the line graph for temperatures prevents confusing the two. Note that temperatures are indicated along the right-hand side of the graph.

Go to page 121.

Question 33

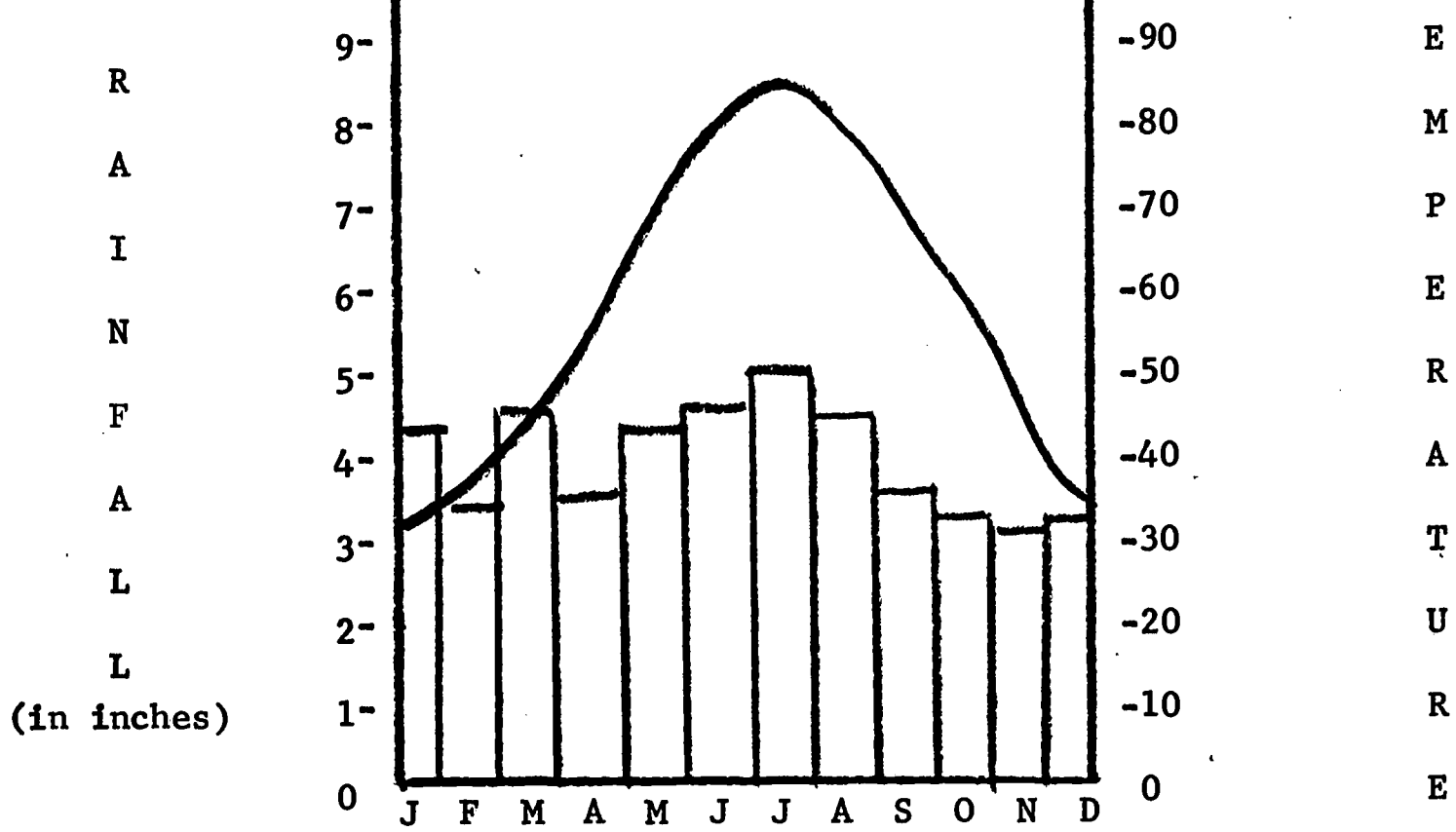
Answer B

Since a bar graph was used earlier to show rainfall data, a line graph is the better choice for showing average monthly temperatures.

Go to page 119.

Information

Temperature and rainfall data can be combined on a single graph called a climograph. Such graphs are often useful for determining important temperature and rainfall relationships. An example of a climograph follows:



You will note on the climograph that the average monthly rainfall reaches a peak of nearly 5 inches in July with rainfall falling in every month. The trend of temperatures exhibits a clear peak in June and July. It must be remembered, however, that the temperature and rainfall information shown are averages. Daily July temperatures may be as high as 90° and as low as 70° and still provide a monthly average of 80° .

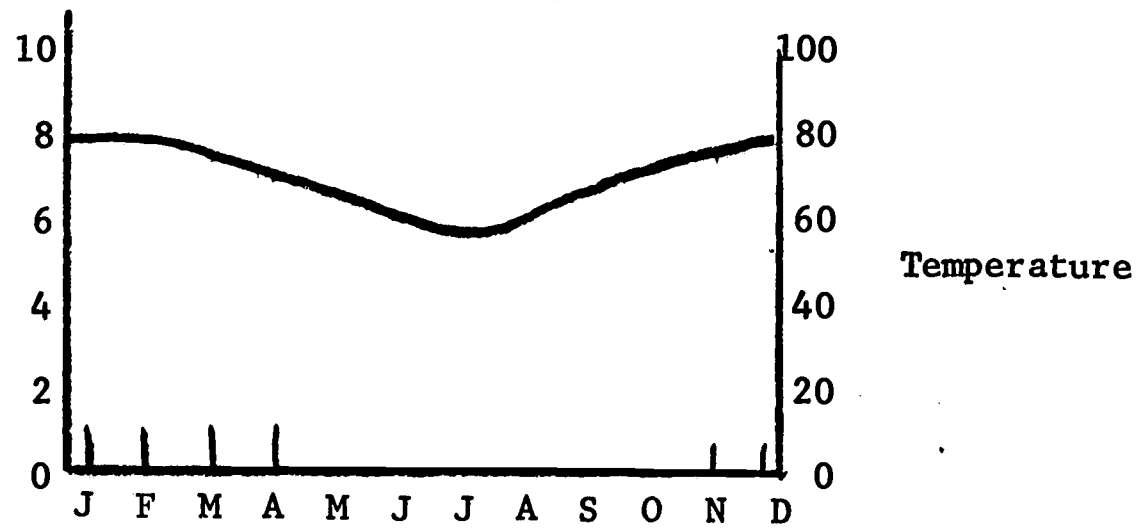
Go to question 34, page 122.

Question 34.

Given the following rainfall and temperature data select the correct climograph.

Month	J	F	M	A	M	J	J	A	S	O	N	D
T	80	80	76	71	63	58	56	61	65	71	75	79
RF	1	1	1	1	0	0	0	0	0	0	0.5	0.5

A)

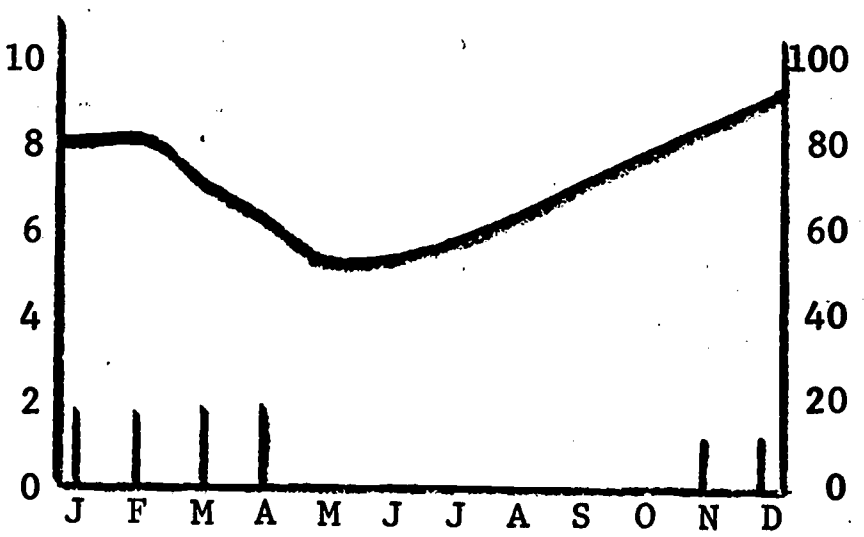


Go to Page 123

B)

Go to Page 124

C)



Go to Page 125

Question 34
Answer A

You have selected the correct climograph for the data given. Remember on the climograph average monthly temperatures are shown with a line graph and average monthly rainfalls with bar graphs.

Go to question 35, page 126.

Question 34
Answer B

You have confused the temperature and rainfall graphs.
Go back to page 121 and begin again.

Question 34
Answer C

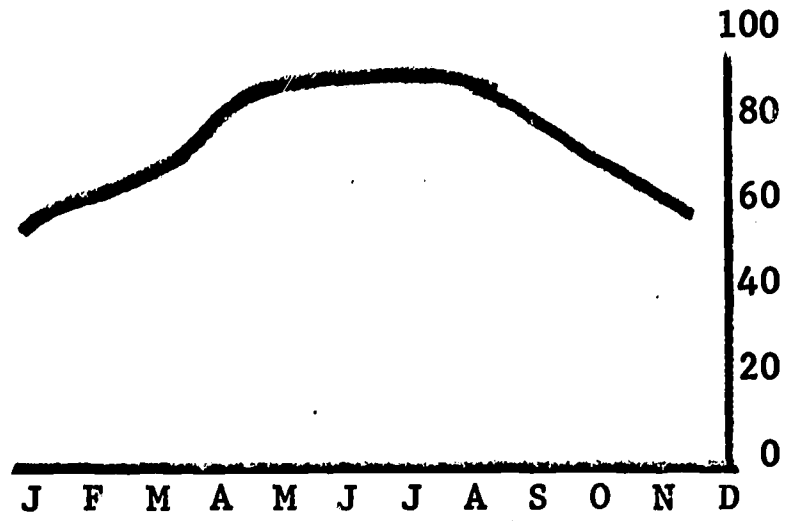
While temperatures are properly shown using a line graph and rainfall data using bar graphs, the climograph does not show the same information as the numerical listing.

Go back to Question 34, page 122, and try again.

Question 35.

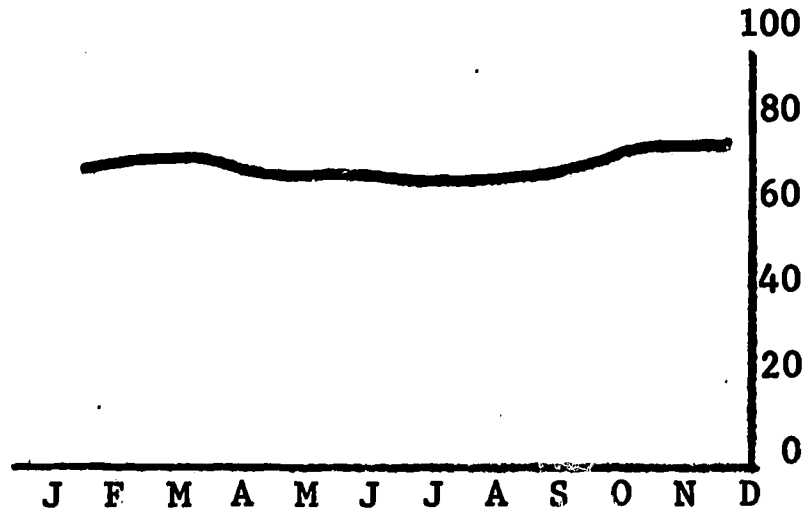
Which of the following places is probably located nearest to the equator?

Location A:



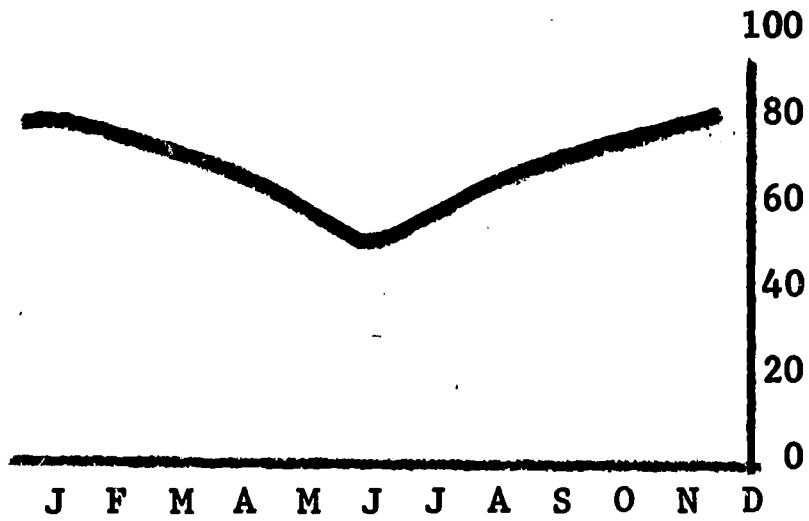
Go to Page 127

Location B:



Go to Page 128

Location C:



Go to page 129

Question 35
Answer A

In questions 15, 16 and 17 (pages 53 to 64), you learned that locations on the equator are characterized by a small temperature range. Since Location A has a range of 28 degrees, check if the other locations given have a smaller range. Also, the higher temperatures of the months from May through August suggest that Location A is north of the equator.

Review questions 15 through 17 (pages 53 to 64). Then try question 36, page 127, again.

Question 35
Answer B

The temperature range for Location B is only 3°. Location B like all places near to the equator are characterized by such small ranges in temperature.

Go to question 36, page 130.

Question 35
Answer C

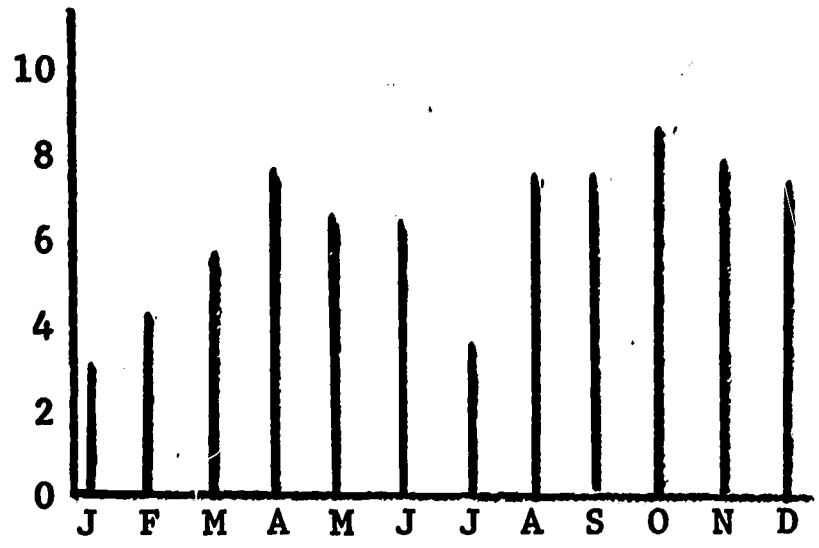
In questions 15, 16, and 17 (pages 53 to 64), you learned that places near to the equator are characterized by small temperature ranges. Since location has a range of 24°, check if the other locations given have a smaller range. Also, the higher temperatures in the months from November through March suggest that Location C is south of the equator.

Review questions 15 through 17 (pages 53 to 64). Then try question 36, page 127, again.

Question 36.

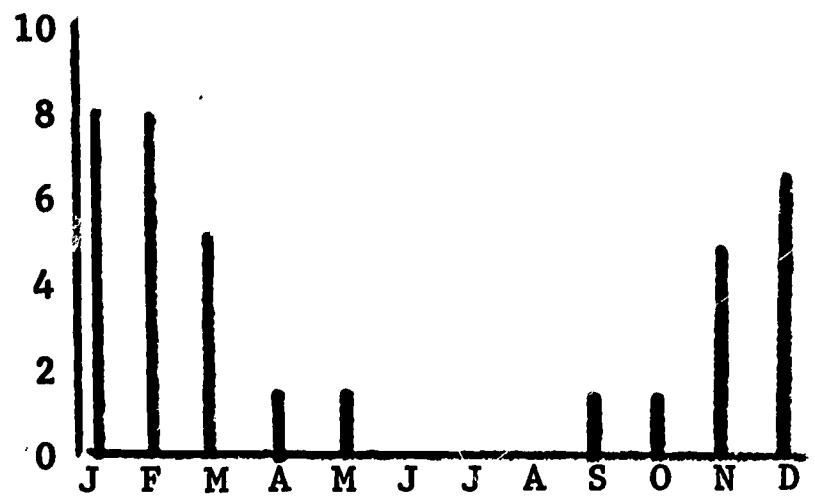
Which of the following places is most likely to be near to the equator?

Location A:



Go to Page 131

Location B:



Go to Page 132

Question 36
Answer A

Good! This city is located near the equator. Two characteristics point this out:

1. no dry season
2. two rainfall peaks.

Go to question 37, page 133.

Question 36
Answer B

In questions 26 to 28 (pages 98-108), we found that stations near the equator do not have a dry season. The occurance of the dry season from April through October indicates Location B to be a place in the southern hemisphere.

Go back to page 130 and study the graph for Location A before reading page 131.

Question 37.

On Map #7 (Appendix) draw a line which connects Algiers and Capetown. Which of the following sequences of climate regions represents the arrangement from north to south along this line?

A. Mediterraen
Semi-arid steppe
Desert
Semi-arid steppe
tropical Savanna
tropical Rainforest
tropical savanna
semi-arid steppe
desert
semi-arid steppe
mediterraen

B. Mediterraen
semi-arid steppe
tropical savanna
desert
sub-tropical
tropical rainforest
sub-tropical
desert
tropical savanna
semi-arid
mediterraen

C. Semi-arid
Desert
semiarid
tropical savanna
tropical rainforest
tropical savanna
tropical rainforest
tropical savanna
highland
sub-tropical
marine

Answer A. Go to page 134.
Answer B. Go to page 135.
Answer C. Go to page 136.

Question 37
Answer A

This arrangement or pattern of climates can be described as being parallel. We find the same order of climate regions north of the equator as we do south of the equator. This pattern reflects the seasonal change in the position of the sun.

Go to question 38, page 137.

Question 37

Answer B

This arrangement is not found along a line from Algiers to Capetown. Have you properly drawn your line on Map 7? If so, check the arrangement of climates against those given on Page 133. Then answer question 37 again.

Question 37

Answer 1C

This arrangement is not found along a line drawn from Algiers to Capetown. Have you properly drawn your line on Map 7? If so, check the arrangement of climates against those given on page 133. Then answer question 37 again.

Question 38.

Draw a line showing the position of the equator on Map #7. Does the same parallel pattern of climates exist along the equator itself?

A.	Yes	Go to page 138.
B.	No	Go to page 139.

Question 38
Answer A

Look at the arrangement again. As you go from the west to the east along the equator, you find the following climate regions: tropical rainforest, highland savanna, tropical savanna, highland savanna, and tropical savanna.

Therefore the correct answer to this question should have been "no."

Go to question 39, page 140, to see if you know why the climate patterns are not parallel along the equator.

Question 38
Answer B

"No" is the correct answer for this question.
Go to question 39, page 140, to see if you know why the climate patterns are not parallel along the equator.

Question 39.

The climates along the equator are modified by the effect of:

A.	Latitude	Go to page 141.
B.	Sun position	Go to page 142.
C.	Elevation	Go to page 143.

Question 39

Answer A

All places along the equator have the same latitude (0^{o}). If different dlimates exist (Map 7), latitude cannot be the cause of such variation.

Try question 39, page 140 again.

Question 39
Answer B

It is true that sun position is a major climate control. However, all locations on the equator come under similar sun relationships. Thus, climate variations along the equator must be caused by other controls.

Try question 34, page 140 again.

Question 39
Answer C

Elevation is the correct response for this question. In question 23, page 86, you should have observed that changes in elevation can bring about temperature variations. Since cooler air is less capable of holding moisture, temperature changes can influence rainfall patterns. Thus, the climate modifications existing on the equator are, in part, an effect of elevation.

Go to question 40, page 144.

Question 40.

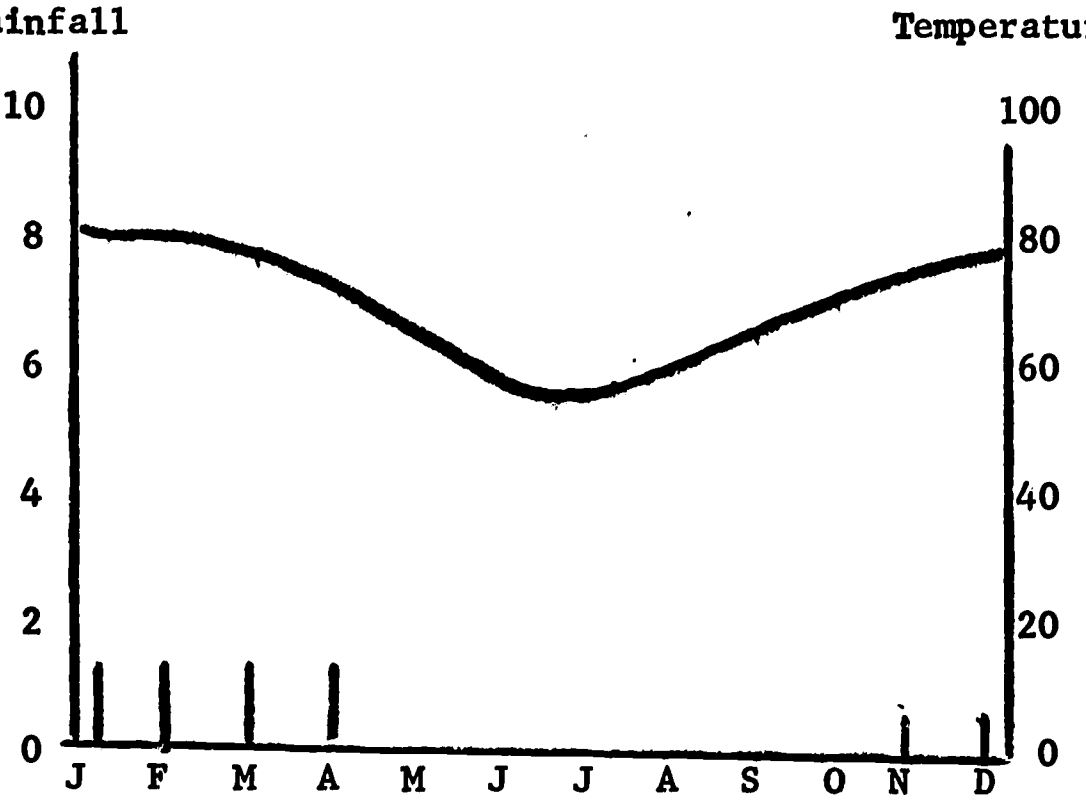
Data is given below for a location in Africa in both tabular and graphic form. After studying the climograph and the numerical listing, where is city A located?

A. On the equator Go to page 145

B. In the northern hemisphere Go to page 146

C. In the southern hemisphere Go to page 147

Month	J	F	M	A	M	J	J	A	S	O	N	D
Temp.	80	80	76	71	63	58	56	61	65	71	75	79
Rainfall	1	1	1	1	0	0	0	0	0	0	0.5	0.5



Question 40
Answer A

Locations on or near the equator should have:

A. Rainfall in each month, with double maximum
B. Small range in temperatures

Location A has neither of these charactersitics.

Go to question 40, page 144,
and try again.

Question 40
Answer B

Locations in the northern hemisphere of the continent of Africa have their warmest temperatures between May and September. Location A has its warmest temperatures from October through April.

Go to question 40, page 144, and try again.

Question 40
Answer C

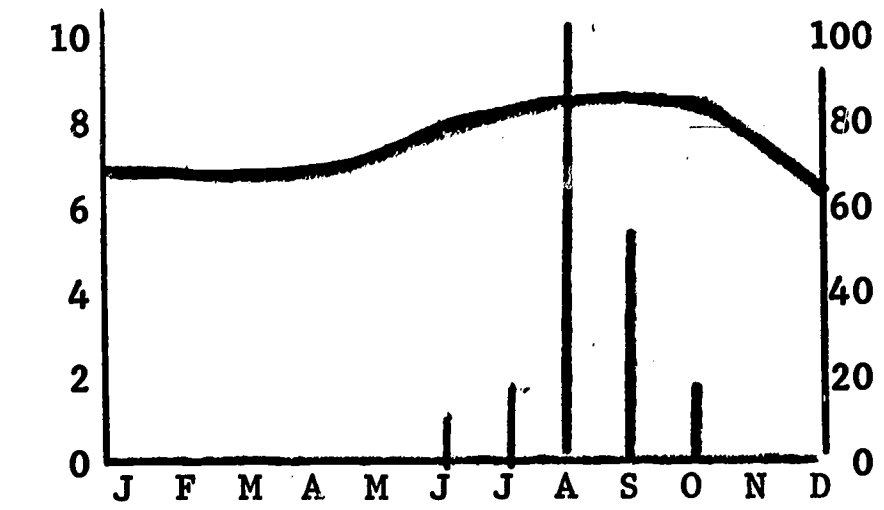
Keetmanshoop, S.W. Africa (27°S, 18°E) is in the southern hemisphere. The months of May through September have lower temperatures since the sun is positioned more directly over the northern hemisphere.

Go to question 41, page 148.

Question 41.

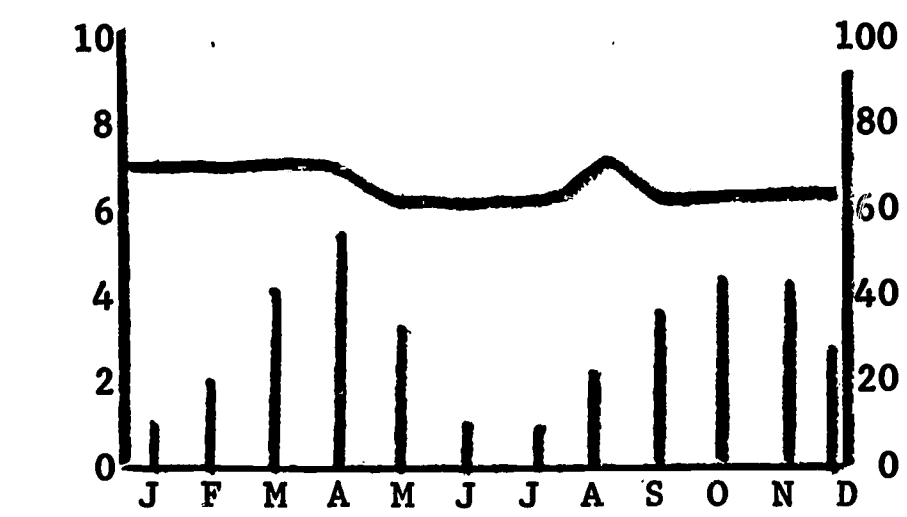
Mbarara (1°S, 31° E) is best represented by climograph:

A)



Go to Page 150

B)



Go to Page 149

Question 41
Answer A

Good. You have associated the almost unchanging temperature graph and a rainfall season with two peaks with Mbarara. These characteristics are best shown in Climograph A.

Go to page 151.

Question 41
Answer B

The climograph depicts a place in the northern hemisphere (highest temperatures occur June through October) some distance from the equator (one period of heavy rainfall).

Study again climograph A, then go to Answer A, page 149.

Agriculturally oriented peoples everywhere organize their activities around major climatic changes. For example, you may have noticed that farmers perform differing tasks, such as planting, caring for growing crops (cultivating), and harvesting during different seasons of the year. The cycle of agricultural activities for corn farmers living in northern Illinois looks like this:

Months	J	F	M	A	M	J	J	A	S	O	N	D
Activity				/Plant/ (P)		Cultivate (C)			/Harvest / (H)			

On the following chart indicate the kind of agricultural activities which farmers near your home engage in each month of the year. Use "P" for planting, "C" for cultivation, and "H" for harvesting. There may be some months in which activities other than planting, cultivating, or harvesting are important. If so, leave such months blank.

Months	J	F	M	A	M	J	J	A	S	O	N	D
Activity												

You should observe that the agricultural pursuits of the farmers living near to your home are closely related to seasonal changes in climate. Since climates vary from place to place, the pattern of activities you gave above will not hold for all places in the world. For example, in Africa seasonal variations in rainfall are more important than are temperature changes. Thus, the amount of rainfall and its distribution throughout the year has a greater effect upon determining month to month agricultural activities. Therefore, as you answer the next group of questions be sure to observe the relationship existing between rainfall distribution and the cycle of agricultural activities.

Mech'a Galla Agriculture

The Mech'a Galla make most of their living through agriculture. They raise cattle and use oxen for plowing, threshing and other heavy farm work. Their most important crops are grains--wheat and barley, t'ef (a grain grown only in Ethiopia and one whose tiny seeds are ground into flour used in making a flat bread), maize and sorghum. They also raise beans, chick-peas, lentils and a number of other crops. Two plants are grown for sale rather than for immediate use--flax and nug. The seeds of these are sold annually to traders who take them to Addis Ababa where they are crushed to extract their oil. The oil is then used in cooking or for various industrial purposes.

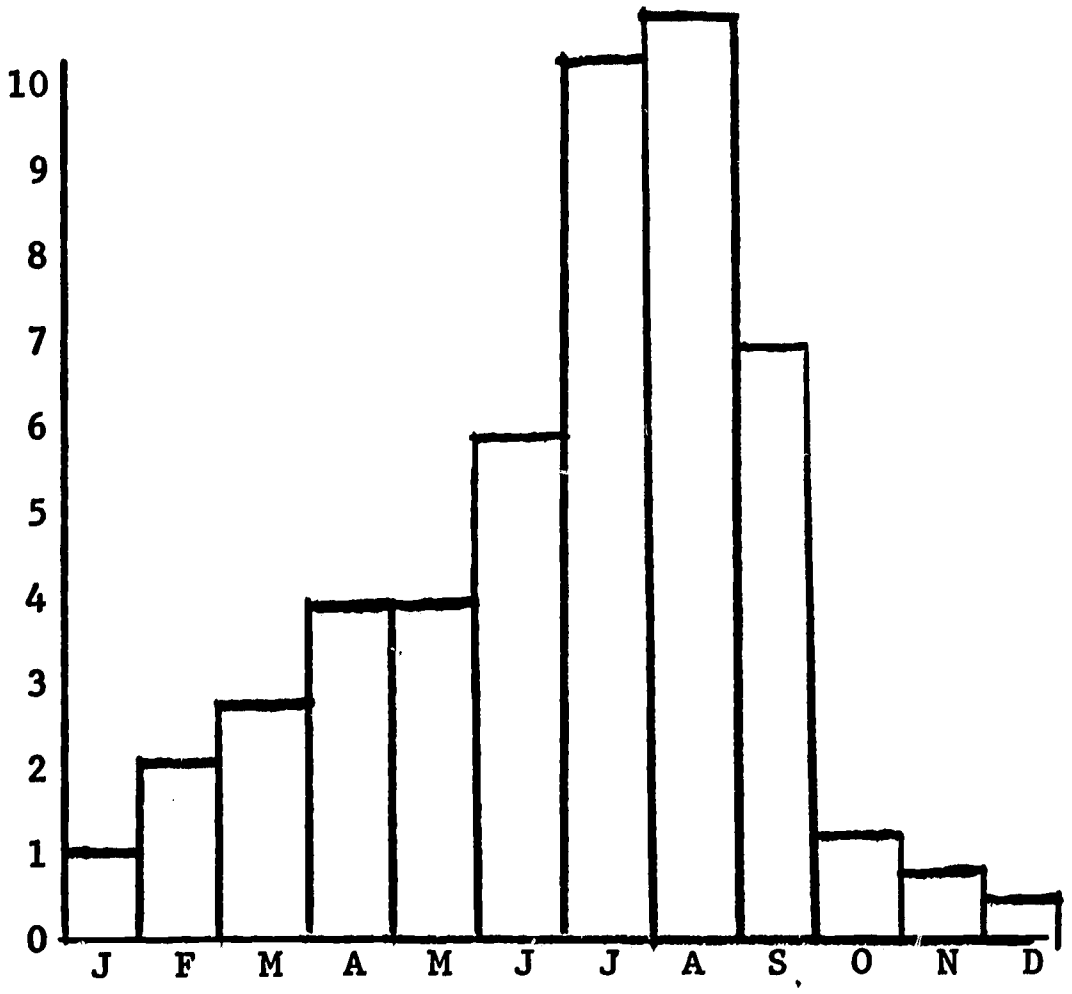
The life of the Mech'a Galla farmer is hard. Most of his waking hours are spent working in his fields. The months from May to September are generally devoted to clearing land, plowing and sowing. The rainy season usually starts in May; the rains soften the ground and provide enough moisture so that seeds planted

then will sprout. Using a wooden plow pulled by two oxen yoked together, the typical farmer must turn over the heavy muddy ground two or three times in order to prepare it for planting. Then, he must plow these same fields once again after sowing the seeds in order to cover then so the ever-present birds will not eat them.

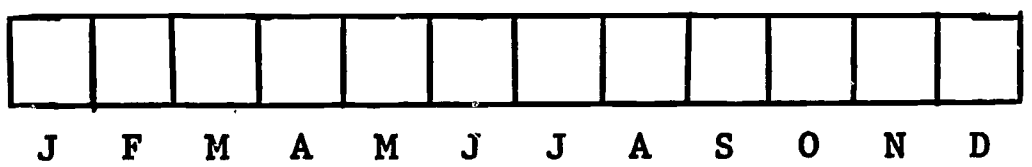
The months following the planting are devoted to weeding and oft-times, hoeing. By late November and early December certain varieties of wheat and other crops are ready to be harvested. The harvest continues into April. This means that a man's day, day after day, for months, consists of bending over and cutting grain a few inches above the ground with a sickle.

After the harvest, the farmer must hurry to prepare his grain for sale or storage else the rains that start in May will ruin his entire year's efforts. The process of collecting,

threshing and winnowing his harvest most often involves all members of his immediate family as well as neighbors and friends. The grain is brought from the field by women and stacked to protect it as much as possible from the rain.



Using the information about the Mech'a Galla, fill in the following agricultural activity chart.



Remember, use
P for Planting
C for Cultivation
H for Harvesting.

Question 42.

When do the planting activities take place?

A. Wet Season Go to Page 156
B. Dry Season Go to Page 157

Question 42
Answer A

In the essay we find, "the months from May to September are generally devoted to clearing land, plowing and sowing." The months of June through September are observed on the climograph to receive the greatest amount of rainfall. Thus, you are correct in associating the rainy season with the activity of planting.

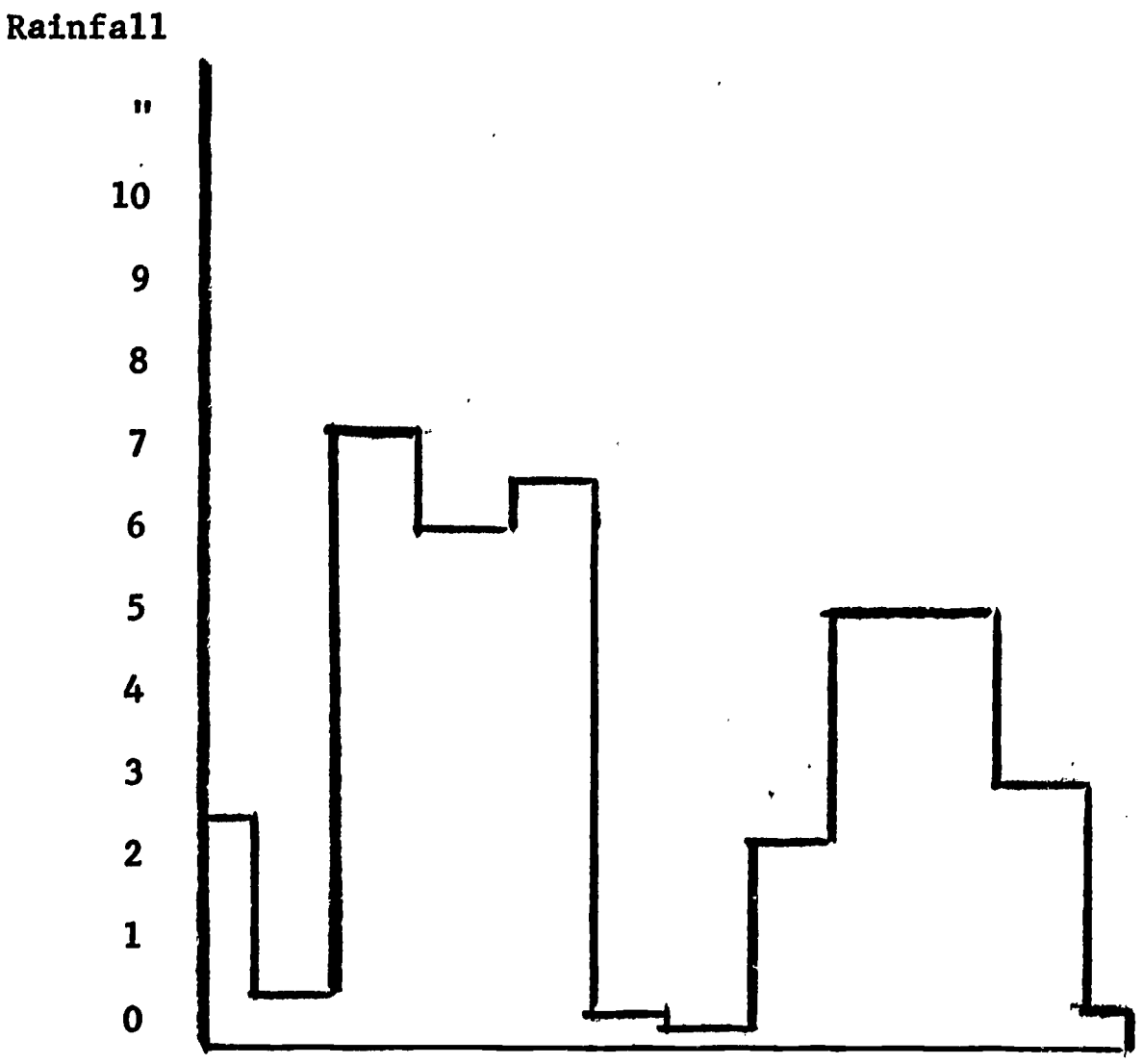
Go to question 43, page 159.

Question 42
Answer B

Ybu should have observed that the months of June, July, August and September receive the greatest amount of rainfall. Also, in the essay you find, "the months from May to September are generally devoted to clearing land, plowing and sowing." Therefore, you should have associated planting activities with the wet season.

Go to question 43, page 159.

Western Ankole, Uganda



Crop	J	F	M	A	M	J	J	A	S	O	N	D
Ground Nuts	C	H								P	C	C
Maize			P	P	C	C	C	H	H			
Peas & Beans	H							P	C	C	C	C
Sorghum	C	C	H	H				P	P	P	C	C
Millet	H				P	C	C	C	C	C	C	H

P = Planting C = Cultivation H = Harvest

After
Hickman G. M. & Dickin's, W. H. G. The Lands & Peoples of East Africa. Longmans, London, 1965. p. 10

Question 43.

How does the seasonal pattern of rainfall affect the agricultural activities of the people living at Rugorogora Shema, Western Ankole, Uganda.

A. Planting occurs during March, April and May; Harvesting takes place during December, January and February.

Go to page 160.

B. The planting and harvesting activities are scattered throughout the year.

Go to page 161.

C. Planting is done at the beginning of each rainy season; harvesting takes place during the following dry season.

Go to page 171.

Question 43
Answer A

The planting activities also occur during months other than March, April and May. Notice that groundnuts (peanuts) are planted in September and October while peas, beans and sorghum are planted from August through October.

Return to question 43, page 159.

Question 43
Answer B

At first, the agricultural cycle appears to be scattered; however the word scattered implies that there is no pattern to the agricultural activities. As you work question 44, page 162 try to see the connection between the rainfall pattern and planting activities in particular.

Go to page 162.

Question 44

On the graph for Rugorogora Shema (page 158), during which months do the greatest amounts of rainfall occur?

A. June, July, January and February
Go to page 163.

B. March, April, May, September and October
Go to page 164.

Question 44
Answer A

Rainfall is heavier in March, April, May, September and October than it is in June, July, January and February.

Check the graph on page 158, then go to page 164.

Question 44
Answer B

The year can be easily described in terms of wet seasons and dry seasons. March, April and May and September, October and November provide two wet seasons. Similarly, December, January and February, and June, July and August provide two dry seasons.

Go to question 45, page 165.

Question 45.

When does the planting of crops seem to take place?

A.	Wet season	Go to page 166.
B.	Dry season	Go to page 167.

Question 45
Answer A

Planting is an activity of the wet season.

Go to question 46, page 168.

Question 45
Answer B

No, planting is an activity of the wet season. Notice Sorghum, peas and beans are planted as the wet season begins in August and September. Maize and millet are planted during March and April at the beginning of the other wet season.

Go to question 46, page 168.

Question 46.

How do the planting and harvesting activities relate to the pattern of rainfall?

A. Planting occurs during March, April and May; Harvesting takes place during December, January and February.
Go to page 169.

B. The planting activities are scattered throughout the year.
Go to page 170.

C. Planting is done at the beginning of the wet seasons and harvesting takes place during the following dry season.
Go to page 171.

Question 46
Answer A

This answer describes only one period of planting and one period of harvesting. The diagram shows that crops are planted at more than one time during the year.

Return to question 44, page 162.

Question 46
Answer B

No, there are two periods of planting and harvesting. Planting is closely related to the coming of the heavier rains in March and April and in August and September. Harvesting of the crops planted during March and April takes place following the dry season of June and July. The crops planted during the wet season beginning in August and September and then harvested following the second dry season.

Return to question 46, page 168, and select another answer.

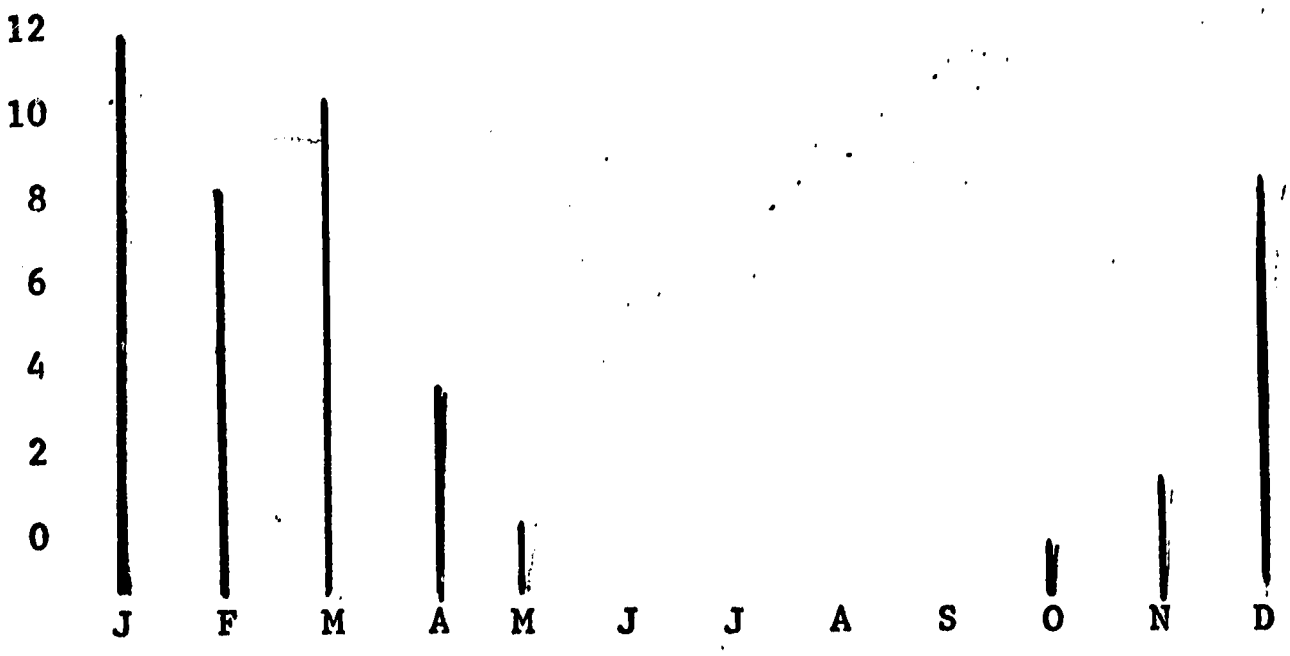
Questions 43 and 46
Answer C

Good. Notice, scheduling the agriculture activities in this manner, the people have their field work spread throughout the year. The people living in such areas as this are quite fortunate in that they are able to raise a variety of crops and thereby minimize the danger of crop failure.

Go to question 47, page 172.

Question 47

Given the graph of rainfall, select the most logical graph of agricultural activities for this place in Africa.



Note: P - Planting, C - Cultivation, H - Harvesting.

A. J F M A M J J A S O N D
P C C H H H P P P

Go to page 173.

B. J F M A M J J A S O N D
C C C H H P P P C C C C

Go to page 174.

C. J F M A M J J A S O N D
P P C C C H H

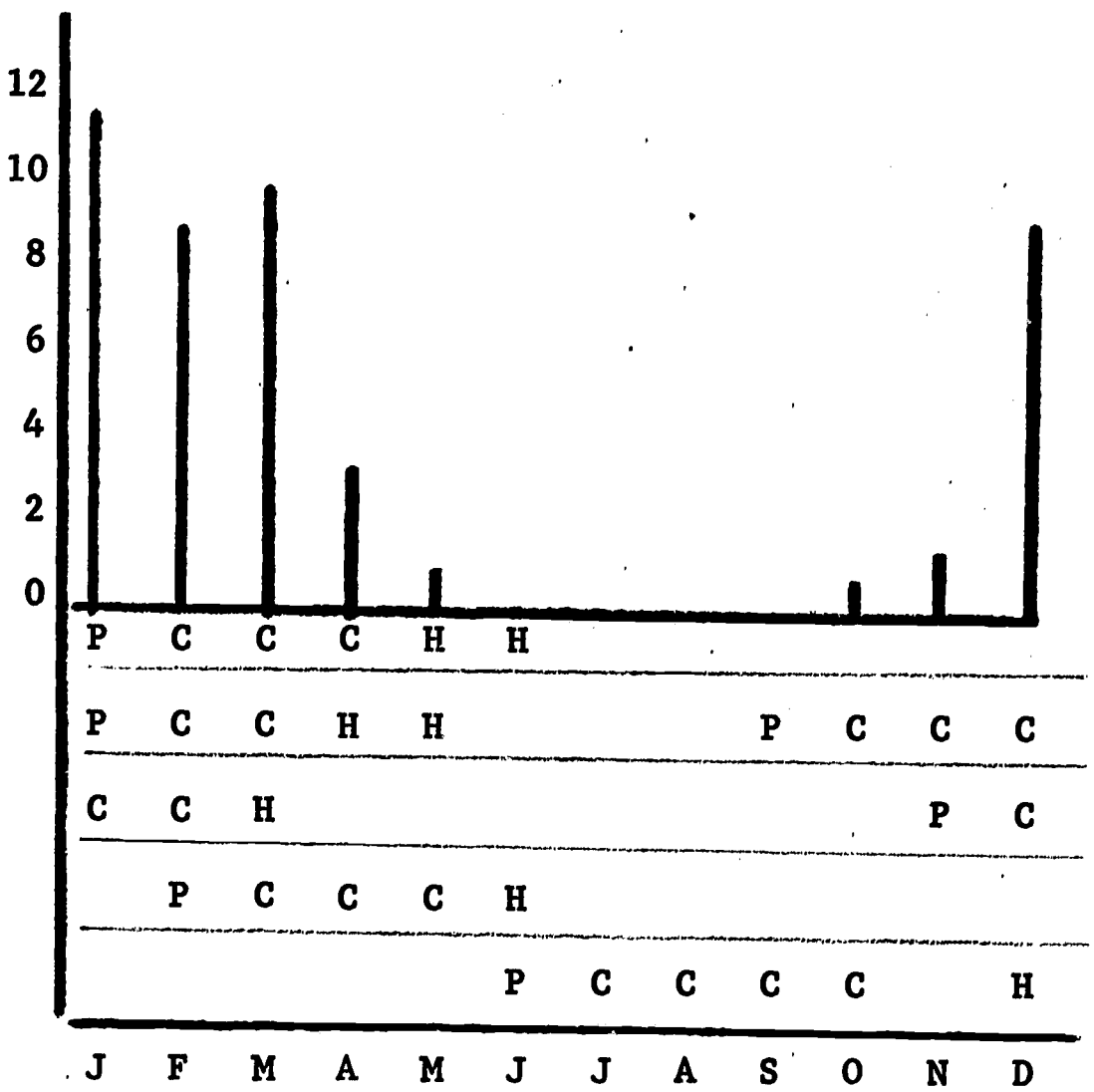
Go to page 175.

Question 47
Answer A

The best sequence of agricultural activities is provided by Choice A. Notice that planting occurs with the beginning of the rainy season in October. Harvesting begins in April and is completed before the very dry months of July through September.

Since farmers living in this climatic zone have learned to minimize crop failures by planting different crops at different times, the actual pattern of activities is more complex than appears in Example A.

For example:



Question 47
Answer B

Congratulations. You and your family just starved to death. The planting activity on the diagram you chose begins in June and continues to August. The first rains come in September. As a result the seed that you placed in the ground would not germinate and grow. The planting of your crops must be timed with the coming of the rains to insure adequate moisture.

Return to question 47, page 172 and select another answer.

Question 47
Answer C

The selection of this answer indicates that you understand crops are planted in the spring, cultivation follows during the summer months and harvesting is an activity of the early fall. However, this is a cycle that you would most likely find in mid-latitude areas of the northern hemisphere, not Africa. Within Africa rainfall not temperature is the major control over agricultural activity. On the chart you chose, notice that no rainfall occurs during the growing (cultivating) months. Without moisture your plants could not survive.

Return to page 172, question 47 and select the agricultural activity chart that provides adequate moisture for the cultivation of crops.

Now that you have completed this programmed exercise, see if you can correctly answer the questions on page 176.

1. Which of the following latitude and longitude readings correctly locates Addis Ababa? (See Maps 2 and 10.)

   A. 19°S 25°W
   B. 6°S 4°E
   C. 12°N 20°W
   D. 9°N 39°E

2. The equator is most closely related to which of the following sun-earth relationships?

   A. The position of the sun in the noonday sky is most directly overhead.

   B. Daylight is equal in length (12 hours) every day of the year.

   C. The highest annual average temperatures are recorded here.

   D. An arbitrary line.

3. Which of the following statements best describes the change that occurs in the range of annual monthly temperatures as one moves away from the equator?

   A. As one moves from the equator the range in average monthly temperature decreases.

   B. As one moves away from the equator the range in average monthly temperature increases.

   C. There is no relationship between temperature range and changes in latitude.

4. Which of the following statements best describes the relationship existing in tropical Africa between rainfall distribution and temperature?

   A. The period of heavy rainfall comes just before the month in which the sun's rays are most directly overhead.

   B. The period of maximum rainfall follows the month in which the sun's rays are most directly overhead.

See page 91.

5. Cities located on the equator in Africa are most likely

   A. to have a pattern of rainfall opposite that of cities in the southern hemisphere.

   B. to have two wet and two dry seasons.

   C. to have some rainfall throughout all months of the year.

6. The sun is most directly over the Tropic of Capricorn during the month(s) of

   A. December
   B. March and September
   C. June

7. The major cause in the change of climatic regions along the equator comes as the result of

   A. latitude
   B. sun position
   C. elevation

8. How does the seasonal pattern of rainfall effect the agricultural activities of farmers in tropical Africa?

   A. Planting occurs as the temperature rises, cultivation occurs during the hot months and harvesting occurs during the cool months of fall.

   B. The planting and harvesting activities follow no set pattern with agricultural activities occuring throughout the year.

   C. Planting and harvesting activities are scheduled to coincide with periods of rainfall and drought.

9. Which of the following has no application to Africa?

   A. Prime Meridian
   B. Equator
   C. Tropic of Capricorn
   D. $40^{o}S$
   E. $40^{o}E$
   F. $25^{o}E$ $25^{o}S$

10. A climograph contains information on

   A. Latitude and temperature
   B. Precipitation and latitude
   C. Rainfall
   D. Temperature and rainfall

Answer Sheet

1. D. $9^{o}N$ $39^{o}E$ (Go to page 31.)

2. A. The position of the sun in the noonday sky is most directly overhead. (Go to page 36.)

3. B. As one moves away from the equator, the range in average monthly temperatures increases. (Go to page 65.)

4. B. The period of maximum rainfall follows the month in which the sun's rays are most directly overhead. (Go to page 91.)

5. C. To have some rainfall throughout all months of the year. (Go to page 98.)

6. A. December (Go to page 44.)

7. C. Elevation (Go to page 140.)

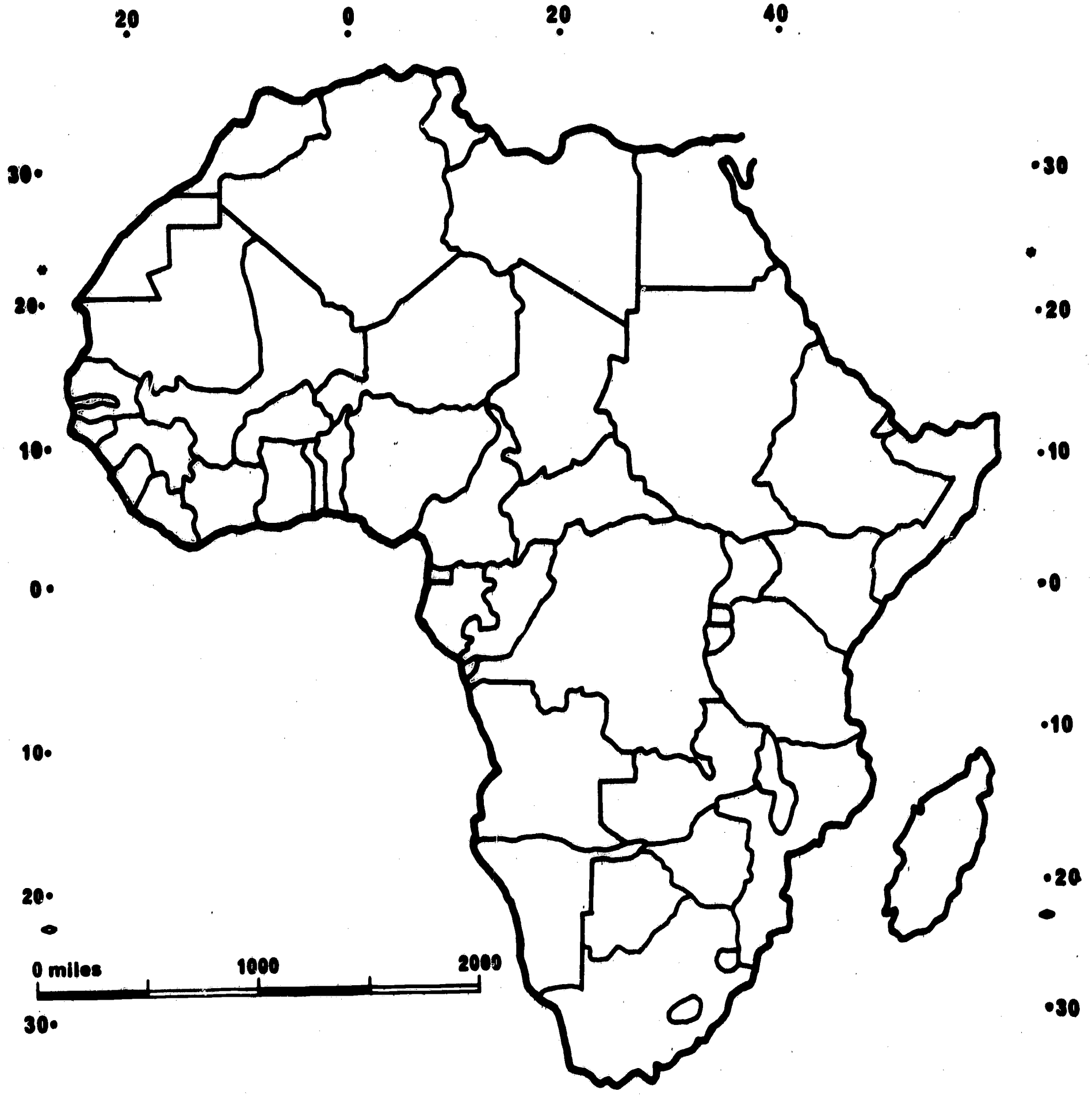
8. C. Planting and harvesting activities are scheduled to coincide with periods of rainfall and drought. (Go to page 151.)

9. D. $40^{o}S$ (Review questions 1 to 9, Pages 1-35.)

10. D. Temperature and rainfall (Go to page 121.)

AFRICA TODAY

1



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POLITICAL DIVISIONS

2

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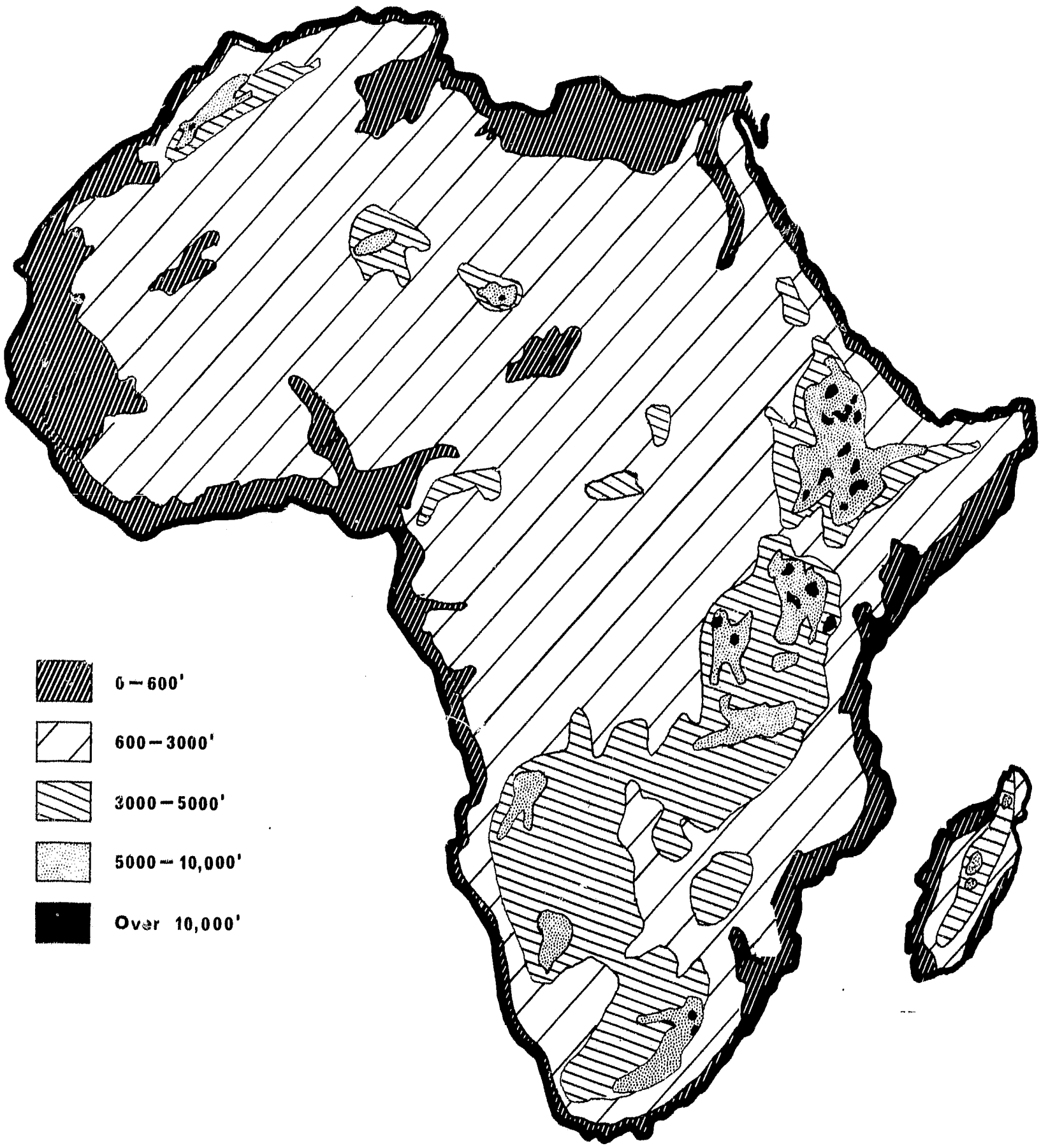
ELEVATION ABOVE SEA LEVEL 3



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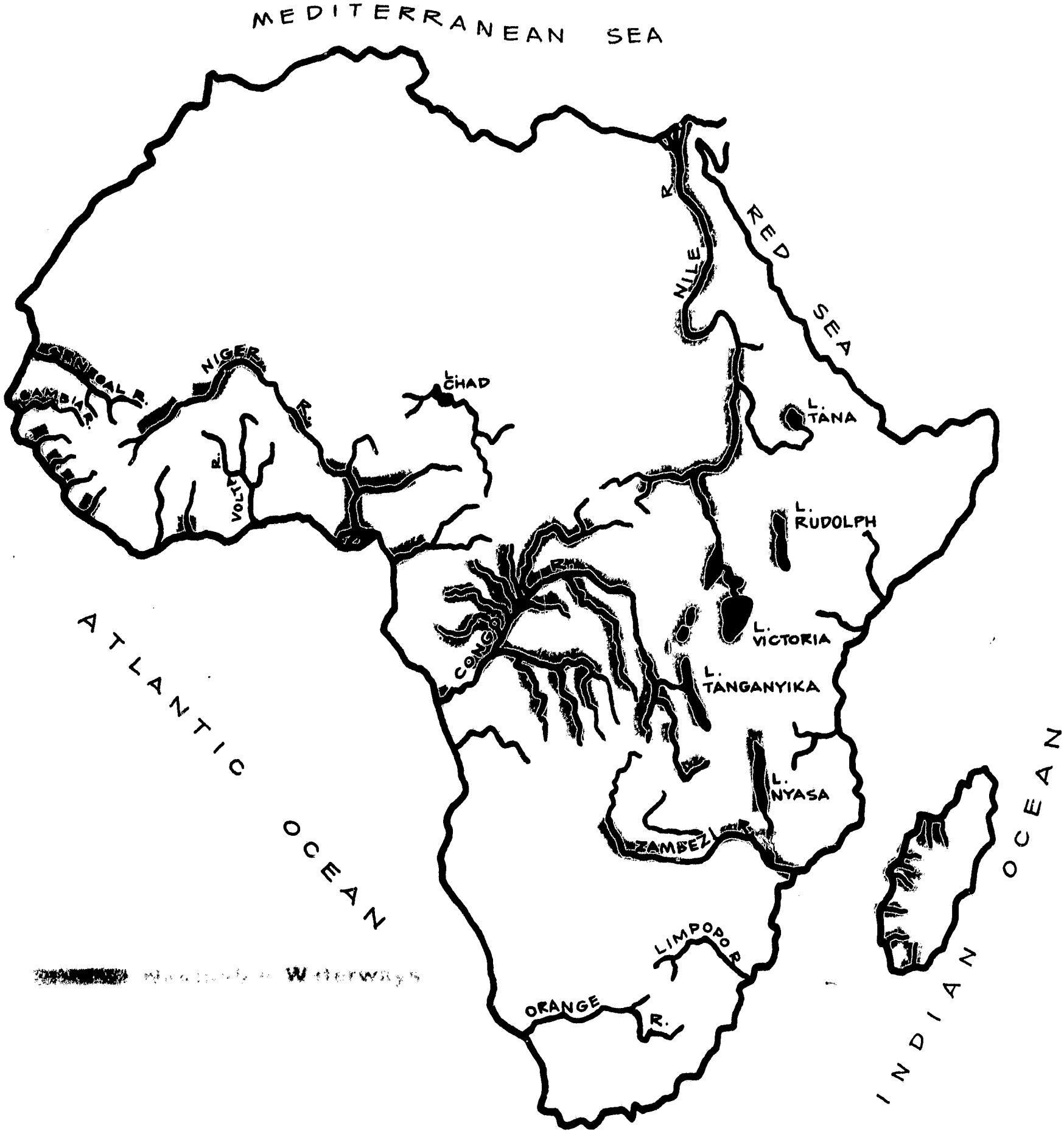
RIVERS and LAKES

4



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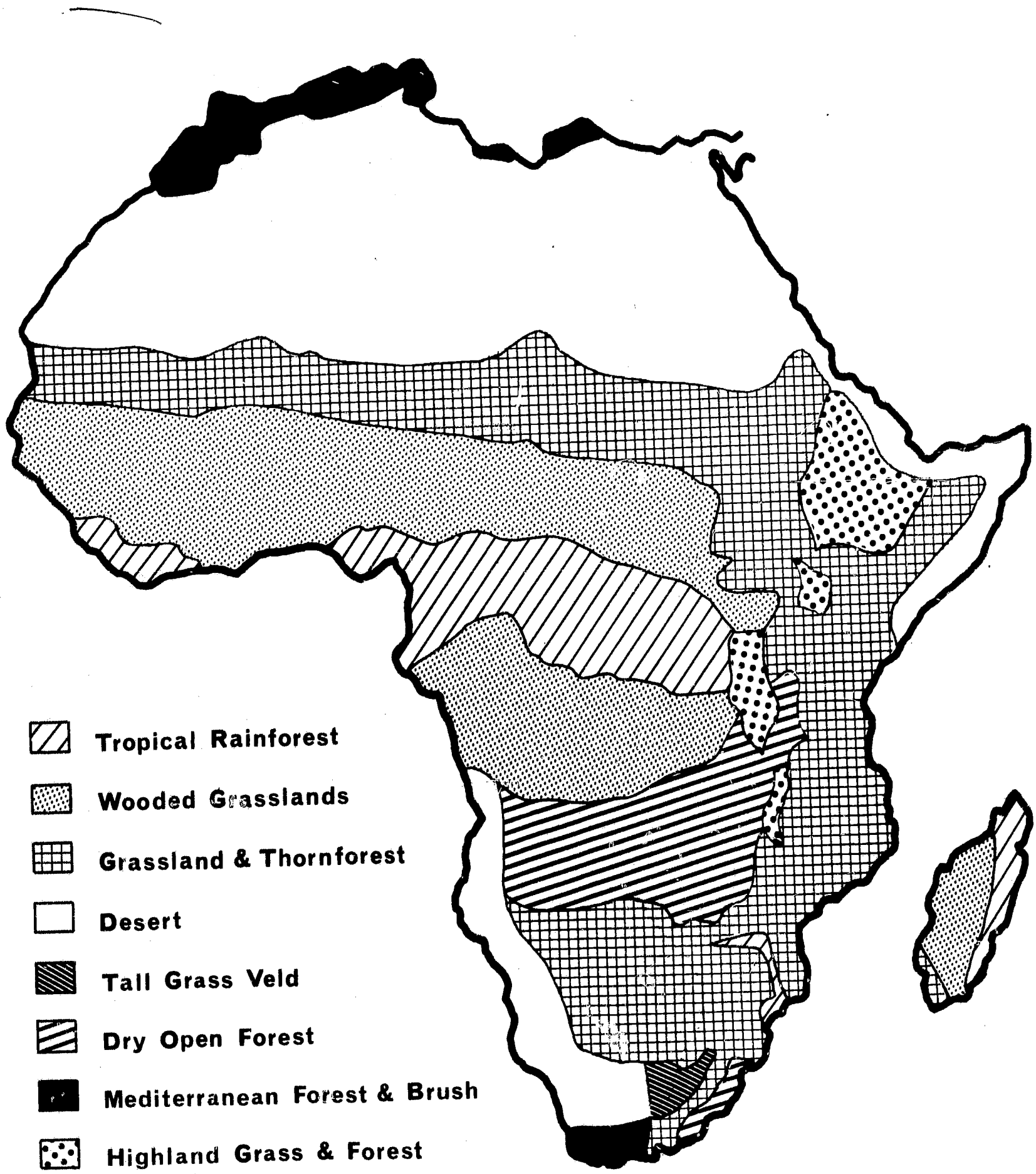
VEGETATION ZONES

5



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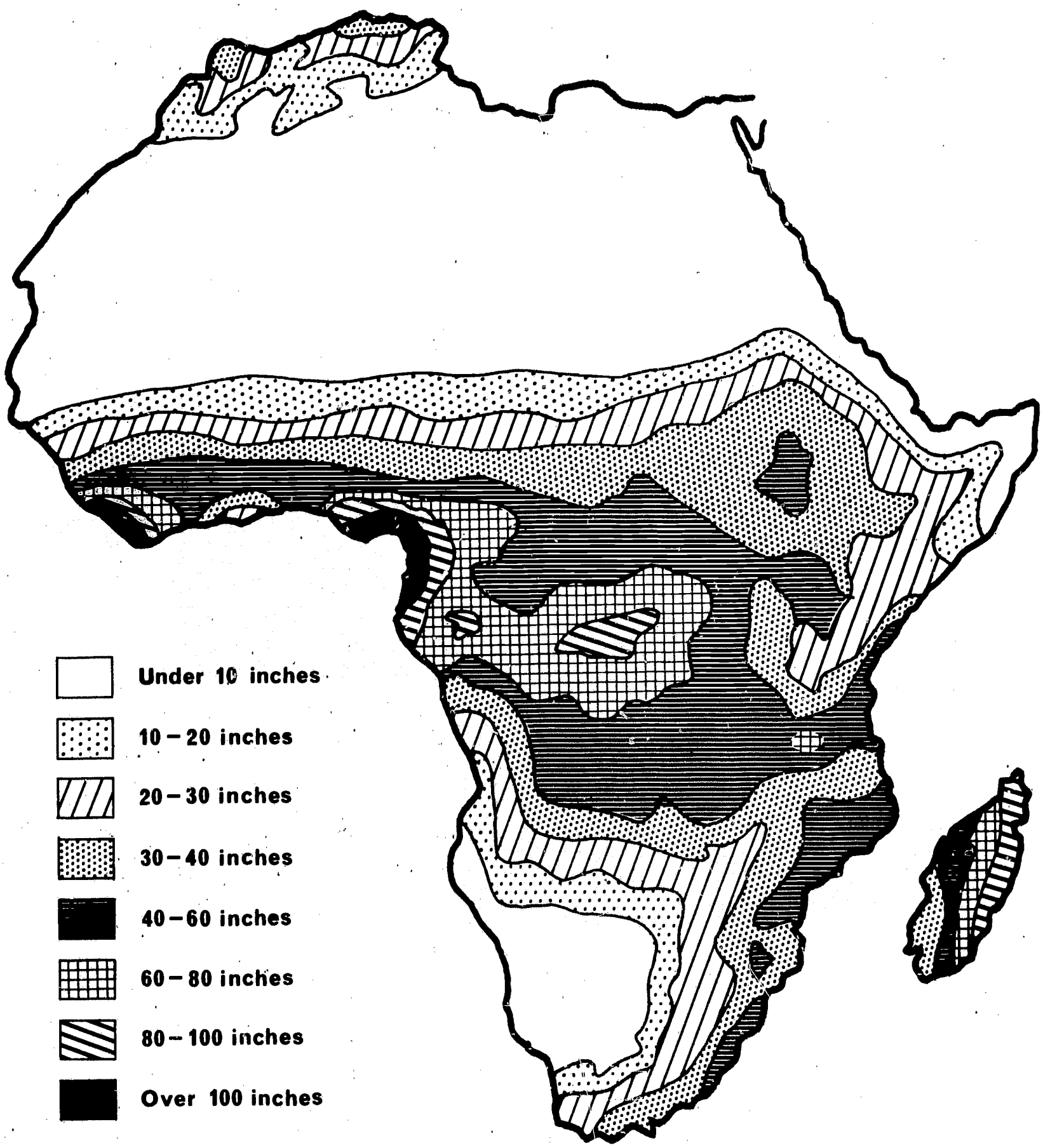
AVERAGE ANNUAL RAINFALL 6



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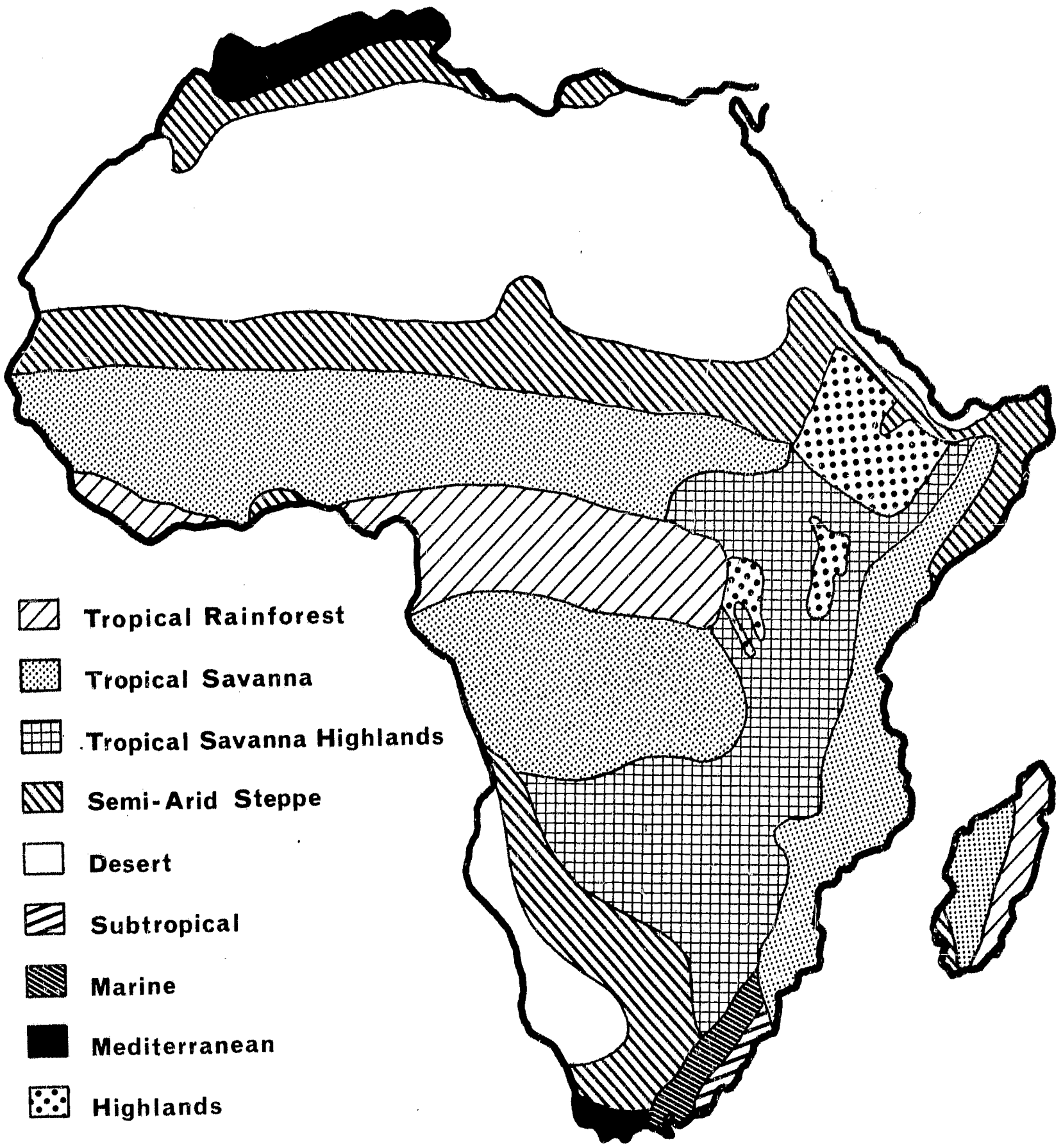
CLIMATE REGIONS

7



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One Dot Equals 10,000 People

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SELECTED CITIES

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